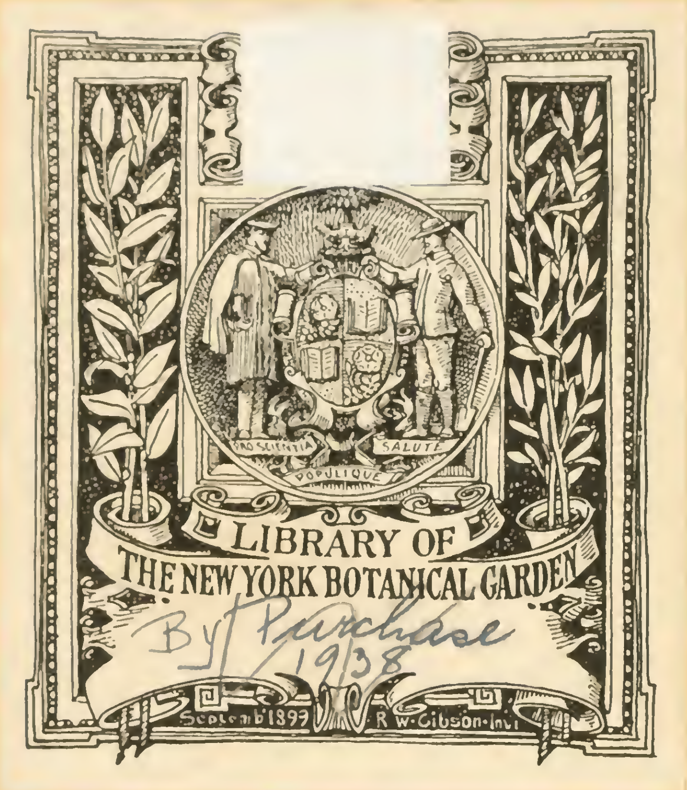

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BY

WILLIS LINN JEPSON

Professor of Botany, University of California

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VOLUME II

CAPPARIDACEAE TO CORNACEAE

(Pages 1–684; figures 128–279.)

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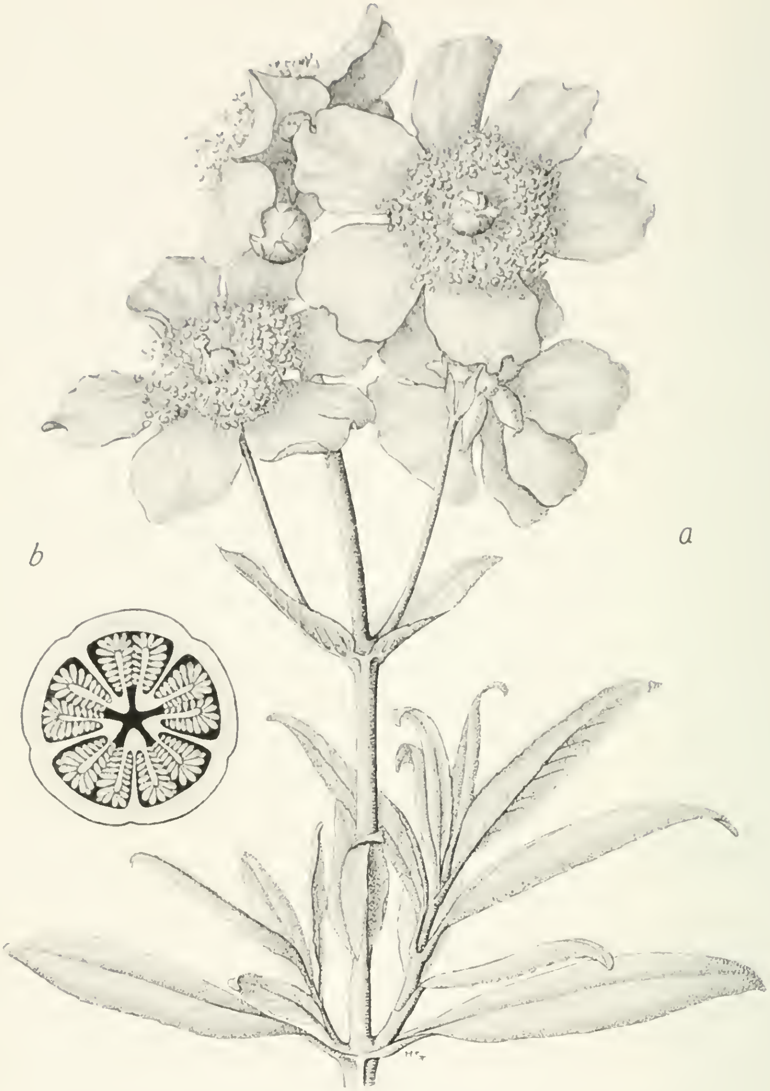

Carpenteria californica Torr. One of the most remarkable of the narrow endemics of California this shrub is confined to a region about twenty miles long in the Sierra Nevada foothills between the cañon of the San Joaquin River and the Big Creek tributary of the main Kings River, mainly from about 1500 to 4000 feet in altitude. *a*, flowering branch, × 1; *b*, cross-sect. of ovary, × 4. See page 141. Drawing by Dr. Helen M. Gilkey. (Frontispiece.)

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CAPPARIDACEAE TO CORNACEAE

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Part 3, pages 177 to 336, July 20, 1936.

ABBY LOUISA WATERMAN

DAUGHTER OF THE DESERT AND OF A RACE OF SAGES,
PENETRATING OBSERVER OF THE ARID WASTES OF MESA AND PLAYA,
PROTECTOR OF THE DESERT MEN AGAINST THE ERRANT FLOW OF CIRCUMSTANCE,
TO HER IS INSCRIBED THIS DEDICATION PAGE
OF THE SECOND VOLUME OF THE FLORA OF CALIFORNIA
BY THE BOTANICAL TRAVELER,
WHO, DRIVEN FROM PITILESS RANGES AND STONE-DRY HIDDEN VALLEYS
IN THE YEAR NINETEEN HUNDRED AND FIFTEEN,
FOUND ELEMENTAL SHELTER AT WATERMAN RANCH
IN THE HEART OF THE MOHAVE.

In North America, at least, Pleistocene history must be interpreted anew; in Europe it is being reinterpreted and we may congratulate ourselves that it is the field-botanist who is able to lead the geologist into clearer paths. The two sciences must draw closer together; until they do both the historical geologist and the plant geographer will continue to work in unnecessary darkness.—MERRITT LYNDON FERNALD.

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AN HISTORICAL SKETCH OF DESCRIPTIVE FLORAS FOR CALIFORNIA, 1838 TO 1880

The first publication that may in a wide and rather loose use of the term be called a "flora" of the Californian area is the "California Supplement" (1838–1841) in Hooker and Arnott's Botany of Beechey's Voyage. In this Supplement are described the collections made by David Douglas during the years 1831 and 1832 in the Coast Ranges, chiefly in the central region. About five hundred and seventy-six species of vascular plants are listed. Some of these plants were obtained by other collectors and a few were gathered far northward beyond the present boundaries of California. In so early a day, the term California, extremely indefinite, was not infrequently compelled to do duty as far as the basin of the Snake River or the snowy volcanic peaks that look northward to the gorge of the Columbia River.

Several collections earlier than those of Douglas had been made in California. The La Perouse Expedition visited Monterey in 1786 but later perished in the South Seas. The botanist of the Malaspina Expedition, Thaddeus Haenke, collected around Monterey in 1791. A few of his California plants were published in Presl's Reliquiae Haenkeanae (1830–1831), but the greater part were destined to lie at Prague for many decades and over one hundred and forty years elapsed before the California collection was taken up as a whole for serious study. Archibald Menzies, botanist of Vancouver's Voyage, made at a half-dozen points along our coast line important collections at intervals from 1791 to 1795, but his plants, nearly all new, were published in a scattered manner by various authors, mostly one or two at a time, over a long period of years. The Russian Kotzebue Expedition visited San Francisco Bay in 1816 and small collections were made by the naturalists, Adelbert von Chamisso and Johann Friederich Eschscholtz. Chamisso's new California plants were not given to the botanical world separately but were published periodically in connection with various materials gathered elsewhere by the expedition. Eschscholtz is the author of a paper with the title "Descriptiones Plantarum Novae Californiae", containing twelve Californian species described as new. This is the first paper, almost exclusively Californian, to bear the word California in its title (Mem. Acad. Imp. Sci. St. Petersbourg, ser. 6, 10:281–292,—1826).

After David Douglas came Thomas Nuttall in 1836, whose collections along our south coast, rich in new species discovered and described by him, were mainly published in Torrey and Gray's Flora of North America (1838–1843). The small collections of the "Sulphur" Expedition, made by Hinds and Barclay along the California coast in the autumn of 1837, were included in the general botanical report of the expedition. The various governmental Pacific Railroad Surveys brought surveying parties to the Pacific Coast from 1853 to 1855, each with its botanist or naturalist. The botanical reports in the various volumes of the Surveys were, in the absence of other literature, extremely useful to those educated men who as gold seekers from the eastern United States lived in California from the year 1848 onward. There were other expeditions by sea, many other expeditions by land (notably those of John C. Fremont), and there were numerous lone individual explorers, but from the beginning of scientific collection in 1786 no publication resulted for full ninety years that could be called a "flora" for our area, save the "California Supplement" appearing in the Botany of Beechey's Voyage.

With the rapid cultural development which came with the inrush of the argonauts, the need for a flora of the entire state became apparent, and expectation of such a treatise developed as part of the working plans of the California Geological

Survey, 1861–1875. The field botanist of the Survey, W. H. Brewer, made considerable collections from 1861 to 1864 and was followed as botanist by H. N. Bolander who served for several years in ways to be remembered. Brewer was the first to collect to any degree in the Sierra Nevada and in many other parts of the state, but he was not by inclination a botanist. The first collector of hundreds and hundreds of plants never before known, he scarcely ever, perhaps never, spoke of them while in California as *species novae* and he described as new to botanical science not above four or five.

The dried plants of the Survey were taken to Harvard University and, amplified by additions from numerous individual collectors, were designed to furnish the basis for a flora. Brewer began work in Cambridge in 1865 but his progress was after several years inconsiderable. Scientifically well trained and with marked intellectual gifts, he was yet devoid of the qualities of mind which make a systematic botanist and possessed no passion or even taste for systematic botany. Consequently, while he struggled laboriously for several years it was to little avail. Thereupon Asa Gray, able and distinguished, and Sereno Watson, competent-minded though as yet with limited experience, took over the task and completed and published the first volume of the Botany of the California Geological Survey in 1876. The second volume, made ready by Watson with the aid of specialists, appeared in 1880. The whole work was based almost entirely on the organography of the flower, fruit and leaf, with relatively little else. If one observe in the Gray Herbarium the extraordinarily limited material available at that time and the many California plants represented by a single insignificant or dubious scrap, the achievement of the authors should be regarded as very remarkable and has only occasionally been surpassed. The publication, long looked forward to with impatient eagerness by the general natural history public in California, was given a felicitous welcome. The two volumes were not disappointing and yet, as exploration of the state went on and as quite new regions were examined, it was soon found that many more, even twice as many or more species existed, both as to plants of narrow habitat and widely distributed or abundant forms, as were described. Moreover, the authors took little or no account of plant associations, zonal distribution or local climates. The herbarium specimen necessarily took first place in the minds of both Gray and Watson, not the living plant. Both these men, to be sure, had been in California. Gray was, however, unable to interest himself in field work, although he sometimes collected a little as a concession to the *mores* of Botany. It is probable that Watson never collected a single plant within the borders of California. The importance of locality, that is the place where the specimen was collected, where the living plant grows, with its extraordinary significance in relation to associated species, topography, altitude, exposure, local climate and other considerations, such as habit and biological factors, exerted comparatively little influence upon these men in connection with their study of herbarium specimens. The range of a species as expressed in general terms was in that day considered important, but less was thought of definite localities. Gray as well as Watson distributed duplicates of the dried plants of Brewer and other collectors to European herbaria without locality, although the original label bore a locality. Neither Gray nor Watson had any prophetic sense of the richness of the vegetation, its highly localized character or degree of differentiation, or of the development within various genera of species swarms. As early as 1870 Gray wrote to a far western correspondent, "Send me a full set of all [your] plants. I hope you may find some new things but you will have to look sharp if you do." Yet to each successive consignment of wholly new materials from western America Gray gave order and arrangement that were a tribute to his native powers.

After Gray's death Edward Lee Greene published four numbers of his Flora Franciscana (1891–1897). This flora was done by a man of scholarly parts who, with a genius for observing plants in the wild, put field work in the forefront of his activities. Had the publication been finished it would have been extremely useful as embodying field studies and was greatly needed, but after leaving California the author's concept of species changed so markedly in the direction of numerous segregation that the completion of the work was not practicable.

The present Flora of California was planned in 1894. That the work upon it should be done here in California was accepted as a matter of course. While convenience of access to the older herbaria is lacking, that lack may be compensated for in some measure by journeys to the eastern United States and to Europe. The advantages otherwise are wholly determinative: the living plant associations, their extent, nature and character,—unique and highly informative—stir deeply the scientific imagination. At once a fundamental canon lies plainly in view, that field investigations be given priority, that field work be regarded as primary. In such an ordering of activity all phases of field records and results, all considerations of analysis, all judgments and conclusions of whatever importance at whatever stage derived, whether in the wild, in cultures, in the laboratory or in the herbarium, tie back ultimately as a basic essential to the living plant, and even more expressively, the living plant at a definite locality in a natural plant formation.

The most significant unit in the classification of living things is, to be sure, the species. It is most important biologically. In any flora the determination of the species and the working concept of the species as a practical matter are all important, since without a sound basis for this biological unit all other considerations fail. On this account it was determined as a matter of fundamental principle that the study of the species should begin (though not end) in the field.

The field work was designed to favor certain objectives which can be expressed as follows:

1. Appraisement of natural specific units in the field as a preliminary to cultural or herbarium determination is to be regarded as a fundamental in scientific method. For a descriptive flora of a region, which is intended to represent plants as they grow in a state of nature, the concept of specific units is best derived in the first instance from the study of genera composed of well-defined units, or from genera which contain highly variable groups in which there is fairly general agreement as to the units.

2. Appraisement of natural units is definitely furthered by a knowledge of the habitat of the plant, the kind of soil, the amount of moisture, the direction of exposure, and the degree of insolation.

3. The study of a colony of a species is necessary in order that a series of specimens taken from it may be selected with reference to a plan and therefore serve well as records. Otherwise, there may be accumulations of apparently diverse material which in reality represent only one unit. In small colonies, evidently representing one close genetic assemblage, the essential likenesses are usually though not always dominant, the variables as a whole inconspicuous or at least so subordinate as to assume a proper relation to the whole social unit. Contrariwise, the preparation of a long series of specimens from either a wide or narrow territory, or from definite phenotopes, if done with the same care, may result in uncovering two or more units formerly thought to be one. Diagnoses made from living plants or from notes of field studies have, therefore, a vitality and force that are quite lacking in descriptions based only on dried plants.

4. Investigation of life histories in the field furnishes marked aid in the recognition of specific units. Such factual matter often provides unexpected differentiae of value and affords means for refined discriminations not otherwise possible. In this vast field progress is necessarily slow but the results are always gratifying. The association of various phases of the plant's life with successive ecological factors often supplements morphological character or may provide a basis for species differentiation when morphological characters may be obscure or fail entirely as constant differentiae. Any developmental character may be of interest, or the character of any organ not usually associated with conventional diagnoses. Seedlings or juvenile stages, for example, often have an importance in determining relationships, because their organs may reveal primitive characters.

5. Investigation of underground organs, their habit and structure, may yield new facts of importance in connection with relationships. This is all the truer in that such organs are not readily observed and are, save by a few ecologists, rather generally neglected.

6. Habitat, temperature and precipitation afford a means of determining the natural position of a species over its entire geographic range, or, in large degree, its climatic requirements, and

so may be used to compare or contrast related species. Since species in great part tend to occupy climatically different areas, knowledge of the climate or climatic position is sometimes effective in relating dubious plant forms to their proper groups.

7. Record of the altitude at which material is taken is always important since it is of primary use in the determination of zonal values.

8. Studies of the associated species at a given locality or in a natural area, their character, abundance and habits, yield basic material of great importance in the segregation and correlation of natural units, especially if the determinations are made in connection with a consideration of climatic or edaphic factors.

9. Determination of the limits of geographic range of a species is always of great importance and the collection of material must keep this object in view. No two species have exactly the same range, because each species by its constitution reacts in its own peculiar way to environmental conditions.

10. Determination of the center or area of highest development of a species by the tests of abundance or dominance of individuals, their size, vigor, tolerance and fertility; by the degree and uniformity of morphological differentiation; by the capacity to hold the territory in competition with other species as involved by temperature, water, insolation, fire and other influences: consideration of these factors must be regarded as a necessary preliminary to the satisfactory description of a species for use in a flora which designs to portray the plant cover of a country. In presenting a record of the plant populations it is necessary that descriptions be written so as to give a view of the prevailing or biologically successful form of a given species, the biotype or natural unit, so to say, instead of the artificial "type" of the herbarium which may represent an outlying or unusual form.

11. Seasonal changes in the structure of organs on one individual, or the production by the individual successively of morphologically different forms of one organ, have a weighty significance on account of the fact that such expressions are often described as distinct species.

12. The degree and character of morphological variation of organs in a species as expressed by a single individual or by several phenotypic individuals from one habitat, or by a colony obviously to be accepted as of one genetic constitution, form a subject for useful field study, and if validated by records and specimens have a marked value in the work of defining the limits of species.

13. Senilism or lethalism in the plant are phases which may likewise yield evidence of value bearing upon the special morphology of a group or the enigmas of relationship.

Ample field records must be made in field books always carried on one's person, so that notes may be made on the spot. Such practice becomes by habit a prime duty in the field. Collections should always be serially numbered in sequence as gathered. Field books thus enriched day by day provide a source of wealth in the laboratory and herbarium for which there is no substitute. Photographic records in the field are also a source of great profit in scientific studies.

Herbarium, laboratory and bibliographic research and garden cultures have each in a flora plan a markedly cogent place, but the purpose of the present note is to evaluate field activity. On account of the extreme diversities of climate and topography in California, the native vegetation presents markedly peculiar, not to say singular, features. Field investigation of the native plants is, therefore, in this undertaking heavily weighted by its fruitfulness and inspiring values. To this day entirely new plants with as strongly marked characters as any obtained one hundred years ago are being found in California. These are highly restricted species of micro-climatic pockets, and not merely segregates of old or well-known species. These discoveries emphasize the aspects of geographically narrow species, which has to do with problems of great moment. With an appreciation of localized endemism and its biological significance, as well as of wide-spread species and broad influences, there may thus be related the essentials preliminary to an understanding of the very beginnings of knowledge concerning the origin of the varied floras of California.

WILLIS LINN JEPSON.

UNIVERSITY OF CALIFORNIA,
BERKELEY,
APRIL 25, 1927.

CHORIPETALAE (concluded[1])

CAPPARIDACEAE. Caper Family

Herbs (ours annuals) or shrubs, with heavy-scented herbage. Leaves alternate, ours palmately compound with 3 (rarely 5) leaflets, or sometimes simple. Flowers perfect in bracted racemes, or solitary and axillary. Bracts usually petioled, conspicuous or minute, even in one species. Calyx-lobes or sepals 4, minute or small, much smaller than the petals, usually persistent. Petals 4, not clawed or scarcely so. Stamens 6 (in Polanisia and other genera often many), nearly equal. Ovary 1 (or rarely 2)-celled, borne on a stipe and often exserted. Receptacle often thickened or lengthened as a torus between the stamens and petals. Fruit a few to many-seeded 2-valved capsule, the valves separating from the filiform placentae, or the valves separating from the axis as closed 1-seeded nutlets.—Species about 550, all continents, but mostly warm regions.

Bibliog.—Torrey, J., Notes on Cleomella (Hook. Jour. Bot. 2:254–255,—1850). Greene, E. L., Peritoma (Pitt. 4:208–210,—1900); Revision of the genus Wislizenia (Proc. Biol. Soc. Wash. 19:127–132,—1906). Payson, E. B., A synoptical revision of the genus Cleomella (Univ. Wyo. Publ. Sci. Bot. 1:29–46,—1922). Parish, S. B., Cleomella obtusifolia Torr. & Frem. (Bull. S. Cal. Acad. 22:12–14,—1923). Crum, Ethel K., Geographic distribution and relationships of Isomeris, Cleomella and Wislizenia (ms).

Shrub; ovary 1-celled, many-ovuled; capsule inflated; torus enlarged at summit into a disk............1. Isomeris.
Herbs.
- Ovary 1-celled; capsule few to many-seeded, its valves separating from the placentae; torus more or less thickened and sometimes lengthened.
  - Flowers in ours white; stamens 8 or more........2. Polanisia.
  - Flowers yellow; stamens 6.
    - Capsule linear to oval (longer than broad)........3. Cleome.
    - Capsule short, nearly as broad as long or broader, more or less flattened contrary to the replum; valves boat-like or conical........4. Cleomella.
- Ovary 2-celled, didymous, the cells with 2 ovules; fruit 2-seeded, each valve closely investing its seed and falling away with it; torus short.
  - Stamens elongated; stipe long; stipules present........5. Wislizenia.
  - Stamens little surpassing petals; stipe very short; stipules none........6. Oxystylis.

1. ISOMERIS Nutt.

Glaucous shrubs. Leaflets 3. Flowers large, yellow, in bracted racemes. Calyx 4-cleft, persistent. Stamens long-exserted. Torus produced posteriorly into a 2-lobed thickening. Capsule large, inflated, coriaceous, long-stipitate, tardily dehiscent. Seeds few, large.—Species 1. (Greek isos, equal, and meris, part.)

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[1] The plan for a Flora of California was conceived and outlined in the year 1894 and work was begun at that time. The duties of the author as an officer of instruction in the University of California were such, however, that his days were closely occupied with scheduled engagements. In addition he had for many years responsibility for the University Herbarium and also assumed many functions having to do with the public welfare. So it was that no free days were available for carrying on the Flora as an investigation project and time for the work was only had by the use of broken hours or even the seizure of flying moments. It was a fixed principle, nevertheless, that no day must pass without thought, however brief, for the opus magnum. During the latter years of these decades of investigation the author has had at irregular periods the help of graduate students as research assistants and this footnote is for the purpose of paying tribute to the aid they rendered. In the years 1917, 1918 and 1925 Alma Union Ames (Mrs. Phillip Weigart) was employed as a research assistant. Endowed with an understanding of unusual breadth and clarity, she apprehended swiftly and soundly the real essence of species problems with a sagacity that has rarely been equalled. From 1919 to 1922 Lulu M. Newlon (Mrs. George B. Upton) gave a service marked by its sobriety, painstaking care and wise appraisements. Dr. Newlon also sensed well the vast extent of the field and the need for finishing tasks in the time allotted. A supplementary service during 1919 and 1920 was rendered by Elizabeth Van Everen Ferguson (Mrs. Walter Steilberg) and by Conrad Vernon Morton (an undergraduate), in 1927. During the period

(Footnote continued on page 10.)

1. **I. arborea** Nutt. Bladder Bush. Branching, 2 to 4 feet high; leaflets oblong, acute, ¼ to 1½ inches long; petals 6 to 8 lines long, the calyx-lobes half as long; capsule elliptical or elliptic-oblong to lanceolate, long-pointed or short-pointed, 1½ to 2½ inches long, on long (½ to ¾ inch) stipes.

Sandy valleys or cañon sides, 500 to 2500 feet; western Mohave Desert, southerly to the western Colorado Desert, thence west to the coast from San Diego Co. to Ventura Co. South to Lower California and Sonora. Feb.-May or Nov.

Note on the flower.—In late April the following notes were made at Cottonwood Springs in the Cottonwood Mountains, n. Colorado Desert: The bushes are now massed with their pendulous pods, the flowers raised above them. The corolla is distinctly "bilabiate" as to position of parts: two petals are erect and approximate, forming an "upper lip"; the two remaining petals form a "lower lip" but are diverging. Four of the stamens spread to the lower side of the flower, the other two spread respectively right and left—the six being equally spaced in the semicircle of the lower half of the flower.—Jepson Field Book, 46:249 (Apr. 25, 1928), ms.

Locs.—Pt. Mugu, Ventura Co., *J. T. Howell* 3134; Simi Valley, Ventura Co., *Jepson* 8456; Santa Susana Pass, *Jepson* 11,901; Fillmore, *Kate J. Stirring;* Saltdale, ne. of Randsburg, *J. T. Howell* 3196; Ludlow, 14 mi. east, *Forrest Shreve;* Old Woman Sprs., *Jepson* 5948; Cottonwood Spr., n. Colorado Desert, *Jepson* 12,615; Lookout Mt. n. of Indio, *Jepson;* Palm Sprs., Mt. San Jacinto, *Jepson;* Whitewater; Playa del Rey, Los Angeles Co., acc. *Abrams;* Aguanga, Riverside Co.; Borrego Spr., w. Colorado Desert, *Jepson* 8894; Grapevine Spr., w. Colorado Desert, *Jepson*

(Footnote continued from page 9.)

from 1930 to 1934 the essentially completed manuscript for the families included in volume two was the subject of verification and preparation for the printer. Lauramay Tinsley (later Mrs. Everett Dempster), who had been employed in 1927, returned in 1933. With an aptitude for specific values and a special interest in the consistency of diagnoses, Mrs. Dempster added a highly developed sense for perceiving clerical slips and typists' errors, discrepancies in word and phrase, a service needful but difficult to secure. For use in this same work, checking the manuscript and validating facts, Joseph Andorfer Ewan was employed in 1932. Stirred by an unusual zest for bibliographic work and possessed of a critical taste in dealing with the California flora, its systematic botany, ecology and geography, he takes a high place in my forty years' roster of graduate students.

From its beginning in the year 1894 the work on the Flora involved a definite planning of underlying foundations. This plan involved many duties and tasks. A few of the more important were: indexing of original factual records; investigation of the life-histories of species in connection with field studies and studies of garden plants and herbarium specimens; careful selection of topotypes, especially for resolving problems offered by the segregationist; dissecting long series of specimens, often to validate a single fact; recording of counts of organs variable in number; comparing the specimen from the wild with the garden culture; geographic analysis of the Californian area in relation to zonal plant distribution; definition of local climatic areas in relation to narrow species; solution of problems as to the special morphology of organs; assembling of specifically or varietally like materials and the determination of specific and minor units; working out of ranges of species, especially in connection with climatic factors and topography; plotting of the range of variation within a species; coördination of specific units within a genus and the definition of their relationships, as also similar work in the case of genera and families. Such and similar tasks occupied the scanty time of the author for twenty-four years and then he was so fortunate as to employ a promising assistant. Recompense for service depended in the main upon the limited private resources of the author, and an assistant, trained with reference to his special talent, was often obliged because of need for a larger income to give up his place as a helper about the time he had become the most useful. The author's obligation to the Flora of California assistants is, nevertheless, twofold: first, for their direct aid; second, for the high-minded integrity of their skepticism and demands for enlightened guidance, which forced from the author ever clearer and ever more rational exposition of the complexities of the daily problems. For this latter advantage the debt may be the greater.

The illustrations are the work of many different artists. In 1901 Mary H. Swift drew the most excellent illustrations of Coniferae and Fagaceae. The originals of a small number of Choripetalae done by Helen M. Gilkey in 1915 recall the beauty of stone engravings. In 1920 and 1921 Louise Nash produced the series of Carex and Juncus drawings which are remarkable for their virility, strength of line and justness of proportion. Frida Abernathy also furnished some drawings, but by far the larger number were made by Joyce M. Saunders. She sensed intuitively what was needed and by the use of few lines produced clear and life-like drawings which were marked by a precision and swiftness of execution that had all the suggestion of deliberate ease. In 1932 Virginia Long Bailey was engaged on various drawings used in volume two. For the devotion of all these artists there is deep appreciation.—W. L. J., January 25, 1935.

8755; Oceanside (Erythea 6:88); Pala Mission, *Jepson;* San Pasqual Valley, San Diego Co., *Jepson;* Mt. Soledad, w. San Diego Co., *Newlon* 331.

Var. **globosa** Cov. Capsules globose to broadly elliptic, abrupty short-pointed, 1 to 1½ inches long.—Coast Ranges from western Fresno Co. to San Diego Co. and east to the Tehachapi Range, 500 to 4000 feet. This variety is merely an extreme form which is connected with the species by intermediate states, although it ranges farther northward than the typical shrub.

Locs.—San Diego; Santa Catalina Isl., *Geo. B. Grant;* Santa Rosa Isl.; Redondo, *Braunton* 321; mts. above Castiac Lake near Tejon Pass, *Jepson* 8935; Rowen, Tehachapi Mts., *Jepson* 6735; Caliente, *Heller* 7628; Santa Maria; Mercy Creek, Little Panoche Pass, *E. C. Van Dyke.*

Var. **insularis** Jepson var. n. Capsules with tapering or salverform bases, the apical point or cusp often very strong.—(Capsulae basi attenuatae vel hypocrateriformes, cuspibus apicalibus saepe robustissimis.)—Santa Catalina Isl.; Santa Rosa Isl. (*T. Brandegee,* type).

Var. **angustata** Parish. Capsules 1½ to 2½ inches long, little inflated or scarcely at all, strongly attenuate to both ends, 1½ to 2½ inches long, 2½ to 7 lines thick at the middle.—Tehachapi Mts. to west side of Colorado Desert. South to Lower California.

Locs.—Tehachapi, *Abrams* 10,789; Twenty-nine Palms, *T. Brandegee;* Borrego Sprs., *T. Brandegee.*

Refs.—ISOMERIS ARBOREA Nutt.; T. & G. Fl. 1:124 (1838), type loc. San Diego, *Nuttall;* Cov. Contrib. U. S. Nat. Herb. 4:67 (1893); Abrams, Bull. N. Y. Bot. Gard. 6:363 (1910); Jepson, Man. 407 (1925). Var. GLOBOSA Cov. Proc. Biol. Soc. Wash. 7:73 (1892), type loc. Caliente Creek, Kern Co., *Coville* 1107; Contrib. U. S. Nat. Herb. 4:67, pl. 4 (1893); Jepson, Man. 407 (1925). *I. globosa* Hel. Muhl. 2:50 (1905). Var. INSULARIS Jepson. Var. ANGUSTATA Parish, Muhl. 3:128 (1907), type loc. Palm Sprs., *Parish. I. angustata* Parish; Dav. & Mox. Fl. S. Cal. 161 (1923).

2. POLANISIA Raf.

Viscid-glandular heavy-scented annuals. Leaves palmately 3 to 5-foliolate. Flowers in a terminal raceme, with simple bracts. Stamens 8 to 32. Petals commonly clawed. Receptacle with a gland behind the ovary. Ovary sessile or short-stipitate. Capsule linear to oblong, many-seeded, erect, on spreading pedicels.—Species about 14, North America. (Greek polus, many, and anisos, unequal, referring to the stamens.)

1. **P. trachysperma** T. & G. Stem erect, branching from below, 7 to 12 inches high; leaflets 3, narrowly ovate to oblanceolate, 6 to 9 lines long; petals white, obovate, strongly notched, clawed; stamens 9 to 16; capsule linear-lanceolate, turgid, 1 to 2¼ inches long.

Dry loose gravelly or sandy soil, 4500 to 5000 feet: northeastern Modoc Co. South to Mexico, east to the Great Plains and north to Washington. July-Aug.

Loc.—Granger Cañon, foothills of the Warner Mts., *L. S. Smith* 1057.

Refs.—POLANISIA TRACHYSPERMA T. & G. Fl. 1:669 (1840), type from Texas, *Drummond;* Jepson, Man. 407 (1925).

3. CLEOME L. SPIDER PLANT

Ours annuals. Leaflets 3, sometimes 5, entire. Flowers yellow or purple, in racemes. Sepals distinct or united at base. Capsule oval to linear, pendulous or erect. Seeds several to many, round-reniform.—Species about 110, all continents in tropical and warm regions. (Ancient name of some European mustard-like plant.)

Calyx 4-cleft; stamens longer than petals; capsule linear, pendent.
  Flowers purple........1. *C. serrulata.*
  Flowers yellow........2. *C. lutea.*
Calyx of 4 distinct sepals.
  Stamens much longer than petals; capsule oval or oblong, pendent........3. *C. platycarpa.*
  Stamens not longer than petals; capsule linear, erect on its stipe........4. *C. sparsifolia.*

1. **C. serrulata** Pursh. ROCKY MOUNTAIN BEE PLANT. Stem erect, simple or branching, 1 to 3 feet high; herbage glabrous; leaflets 3, oblong or oblong-lanceolate, entire, 1 to 2 inches long; flowering racemes dense; calyx-lobes mucronate or

subulate, short, mostly shorter than tube; petals reddish purple, sometimes pinkish or white. 3 to 5 lines long; capsule linear, sometimes torulose, 1 to 2¼ inches long; pedicel about equaling stipe, pedicel and stipe together nearly to fully as long as capsule.

Valleys or flats, 5 to 2200 feet: rare in Southern California. Arizona to Washington and east to the Rocky Mts. June-July.

Locs.—San Diego, "Indian Reservation," *Orcutt* in 1883; Claremont (Bull. S. Cal. Acad. 24:49); Pt. Sur, *K. Brandegee;* Barstow (Bull. S. Cal. Acad. 14:15); Tulare Lake region, acc. Kennedy. These, the only known collections in California, probably represent waifs or casual introductions.

Refs.—Cleome serrulata Pursh, Fl. 441 (1814), type loc. "on the banks of the Missouri," *Lewis;* T. & G. Fl. 1:121 (1838); Pax, Bot. Jahrb. 14:293 (1892); Jepson, Man. 407 (1925). *Peritoma serrulatum* DC. Prod. 1:237 (1824). *C. integrifolia* T. & G. Fl. 1:122 (1838); Gray, Am. Jour. Sci. ser. 2, 33:404 (1862). *Peritoma integrifolia* Nutt. Jour. Acad. Phila. 7:14 (1834).

2. **C. lutea** Hook. Gold Cleome. Similar in habit to C. serrulata; herbage glabrous; leaflets 3 to 5, oblong or oblong-oblanceolate, mucronate, mostly ¾ to 1½ inches long; calyx-lobes triangular-acute to lanceolate, longer than tube; petals golden yellow, 3 lines long; capsule linear, ½ to 1½ inches long, of about the same length as stipe and pedicel together; stipe about equaling pedicel.

Sandy flats in the deserts or arid interior, 4000 to 5000 feet: Inyo and Mono Cos. North to Washington and east to Colorado. May-Aug.

Locs.—Independence, *Jepson* 909; Bishop, Inyo Co., *Almeda Nordyke;* Deep Spring Valley, *Purpus* 5812; Bridgeport, Mono Co., *Congdon;* also at Downey, Los Angeles Co. (Abrams, Fl. Los Ang. 181), as a waif. Nev.: Sodaville, Esmeralda Co., *Shockley* 662.

Refs.—Cleome lutea Hook. Fl. Bor. Am. 1:70, t. 25 (1833), "banks of the Columbia; and in the valleys of the Blue Mts.", *Douglas;* Lindl. Bot. Reg. 27:t. 67 (1841); Jepson, Man. 407 (1925). *Peritoma luteum* Raf. Sylva Tellur. 112 (1838).

3. **C. platycarpa** Torr. Stink-clover. Stem erect, viscid-pubescent, ¼ to 2 feet high; leaflets 3, oval or oblong, ⅓ to 1 inch long; bracts oval or oblong, petioled; flowering raceme dense; sepals subulate; petals golden yellow, ovatish-oblong, 3 to 3½ lines long; capsule turgid, oval or oblong, 8 to 12-seeded, ½ to 1 inch long, the stipe mostly a little shorter.

Dry gravelly or sandy clays, 2700 to 5000 feet: Butte Co. to Siskiyou and Modoc Cos. Oregon; western Nevada. June-Aug.

Locs.—Butte Co., *R. M. Austin;* Likely, Modoc Co., *C. C. Bruce;* Adin, *Linda Dodd;* Alturas, *L. S. Smith* 925 (with soft white hairs and stiffish spreading purplish hairs intermixed); Liberty, Modoc Co., *F. Stephens;* Shasta Valley, *Butler* 1335; Yreka, *Greene* 845. Verdi, Nev., *Sonne* 452.

Refs.—Cleome platycarpa Torr. Phanerogamia of Pacific Coast of N. Am. 235, t. 2 (1874), type loc. Klamath River, n. Cal.; Jepson, Man. 407 (1925).

4. **C. sparsifolia** Wats. Stem erect, branching, ½ to 2 feet high, glabrous, sparsely leaved; petioles ½ to 1¾ inches long; leaflets 3, obovate to cuneate, 2 to 5 lines long; racemes few-flowered; flowers 3 to 4 lines long; sepals denticulate; pedicels 1 to 3 lines long; petals spatulate, greenish-purple with white margins, 5 lines long, with nectar-bearing scale at base; stamens not longer than petals; capsule linear, ¾ to 1¼ inches long; stipe 1½ or 2 lines long.

Clayey soil, 3000 to 6450 feet: Inyo and Mono Cos. Also western Nevada. May-June.

Locs.—Keeler, *J. Grinnell;* Mono Lake, *Peirson* 10,761. Nevada: Peacock's Ldg., Winnemucca Lake, *K. Brandegee;* Rhodes, Esmeralda Co., *Shockley* 360.

Refs.—Cleome sparsifolia Wats. Bot. King 32, pl. 5 (1871), type loc. Ragtown, Churchill Co., Nev., *Watson* 133; Jepson, Man. 408 (1925).

4. CLEOMELLA DC.

Annuals. Leaves with 3 leaflets. Flowers yellow. Pods rhomboidal, few-seeded and small, pendent or spreading on a long or short stipe and pedicel, ours with the valves laterally distended or produced into short horns or rarely hornless.—Species about 12, North America. (Diminutive of Cleome.)

Flowers solitary and axillary; capsule mostly deflexed on its pedicel.
  Leaves long-petioled, hirsutulose; stipules scarious-laciniate, resembling a tuft of wool.......... 1. *C. obtusifolia.*
  Leaves subsessile, glabrous; stipules none..........2. *C. brevipes.*
Flowers in racemes; herbage glabrous.
  Stipe almost obsolete, the pedicel elongated; stipules present..........3. *C. parviflora.*
  Stipe and pedicel about equal, widely spreading or the stipe sometimes a little deflexed on its pedicel; stipules none..........4. *C. plocasperma.*

1. **C. obtusifolia** Torr. & Frem. Mohave Stinkweed. Plants 5 to 10 inches high, diffusely branched, or the trailing stems ½ to 3 feet long, with ascending branchlets; stems glabrous, rarely hispid or scabrid; leaflets somewhat succulent, obovate, thinly hirsutulose, 2 to 8 lines long, the apex with a mucro or hair; pedicels 3 to 4 lines long; calyx-lobes ovate, pilose-ciliate; petals bright lemon yellow or pale orange, oblong, hispidulose on back of blade, narrowed to a short broad claw, 2½ lines long, all 4 turned to upper side of flower or 2 of them spreading horizontally right and left; stamens raised on a torus, exserted; capsule 3 to 4½ lines broad, its valves conical, often produced into a short beak, or frequently rounded; stipe in fruit 3 lines long, reflexed upon its pedicel.

Sandy mesas or washes, 200 to 4000 feet: Inyo Co. and south to the Mohave Desert and Colorado Desert. East to western Arizona. June-Aug.

Field note.—The herbage has a noxious pervading odor. The narrowed bases of the two upper petals have somewhat revolute margins, revolute in such a way as to form a sort of tubular structure. The edges of the revolute portion of the petals are in some cases distinctly serrulate. Doves feed on the seeds, whence the folk name "Dove Weed."

Locs.—Keeler, *J. Grinnell;* Alabama Hills, Inyo Co., *Jepson* 919; Owens Lake, *Jepson* 5099; Searles Lake, *Jepson* 7154; Barstow, *Jepson* 4793; Rabbit Sprs., *S. B. & W. F. Parish* 1287; Box S Ranch, s. Mohave Desert, *J. T. Howell* 2680; Twenty-nine Palms, *Jepson* 12,631a; San Felipe Wash (e. of Borrego Valley), *Jepson* 8900; Coyote Wells, s. Colorado Desert, *Jepson* 11,775.

Var. **pubescens** Nels. Stems and foliage very pubescent.—Mohave Desert (Lancaster, *Greene;* San Bernardino Mts., desert slope, *Hart*); Kern Co. (Walker Pass, *Purpus* 5562). East to Nevada.

Var. **jonesii** Crum var. n. Flowers scattered in small axillary or terminal clusters.—(Flores in fasciculis parvis, axillaribus vel terminalibus.)—Mohave Desert (Box S Ranch, *Jones,* type; Hinckley, *Jones*); Colorado Desert (Coyote Wells, *McGregor* 143).

Var. **florifera** Crum var. n. Flowers concentrated at the ends of the nearly paniculate branches. (Inflorescentia terminalis, subpaniculata.)—Mohave Desert (Lancaster, *Jones;* Cushenbury Sprs., *Jones;* Newberry Sprs., *Jones*); Inyo Co. (Little Lake, *Jones,* type).

Refs.—Cleomella obtusifolia Torr. & Frem.; Frem. 2d Rep. 311 (1845), type undoubtedly from the Mohave Desert, *Fremont,* certainly not collected "on the American fork of the Sacramento River"; Jepson, Fl. W. Mid. Cal. 229 (1901), Man. 408 (1925). *C. taurocranos* Nels. Proc. Biol. Soc. Wash. 18:172 (1905), type loc. Colorado Desert, *Orcutt* 1484. Var. pubescens Nels. l. c., type loc. Mohave Desert, *Engelmann;* Jepson, Man. 408 (1925). *C. pubescens* Nels. l. c. 173. Var. jonesii Crum. Var. florifera Crum.

2. **C. brevipes** Wats. Stem diffusely branched from the base, nearly glabrous, 2 to 10 inches high; leaves subsessile; leaflets linear, 4 to 6 lines long, or the upper leaves simple and similar to the leaflets; flowers solitary in the axils of nearly all the leaves; petals obovate, ¾ line long; stamens shorter than petals; capsule 2 lines broad, broader than long, its valves produced into short but distinct horns; pedicel and stipe recurved, 1 to 2 lines long.

Alkaline shores, salt meadows or washes, 2000 to 4000 feet: Mohave Desert north to Inyo Co. East to western Nevada. May-July. The habit of the plant is suggestive of an annual Suaeda.

Locs.—Near Daggett; Owens Lake, *Jepson* 5096. Ash Mdws., Nev., *Purpus* 6045.

Refs.—CLEOMELLA BREVIPES Wats. Proc. Am. Acad. 17:365 (1882), type loc. Camp Cady (near Daggett), Mohave Desert, *Parish Bros.* 1289; Jepson, Man. 408 (1925).

3. **C. parviflora** Gray. Stem mostly freely branching from near the base, 4 to 10 inches high; herbage glabrous; leaves very shortly petioled; leaflets linear, ½ to 1 inch long; flowering raceme dense, its bracts commonly simple, sometimes similar to the leaflets and not reduced, sometimes much reduced; stamens not exceeding the (1 line long) petals; capsule deltoid, 2 lines broad, the valves gibbous or navicular, very bluntly if at all beaked; pedicels 8 to 13 lines long, the stipe ⅕ to ½ line long.

Alkaline soil, 2000 to 4000 feet: east of the Sierra Nevada from Lassen Co. to Owens Valley, and south throughout the Mohave Desert. Western Nevada. May-June.

Locs.—Amedee, Honey Lake Valley, *Davy* 3352; Bishop, *Heller* 8289; Owens Lake, *Purpus* 5742; Twenty-nine Palms, *T. Brandegee;* Rabbit Sprs., *Parish;* Victor, *Jones;* Rosamond, Antelope Valley, *Davy* 2247.

Refs.—CLEOMELLA PARVIFLORA Gray, Proc. Am. Acad. 6:520 (1865), type loc. near Carson City, Nev., *Anderson;* Jepson, Man. 408 (1925). *C. alata* Eastw. Zoe 5:87 (1900), type loc. Shumway, Lassen Co., *C. C. Bruce* 2364a; this appears to be a young state with the leaf bases decurrent on the stem as very narrow wings; in young specimens of genuine C. parviflora this condition may sometimes be obscurely noted. As to the character, 2 of the stamens "united by the filaments", 2 stamens are often partly united by their filaments in C. parviflora.

4. **C. plocasperma** Wats. Stem erect, simple or branching, 5 to 24 inches high; herbage glabrous; leaflets lanceolate or linear, ½ to 1½ inches long, the petioles as long to half as long; flowering racemes dense; petals a pale but not dull yellow, 2 lines long, exceeded by the stamens; capsule 1 to 1½ lines long, rhomboidal in outline, the valves angular or low-conical; stipe and pedicel about equal, the two together 8 to 10 lines long.

Alkaline soil, 500 to 4000 feet: Lassen Co. North to Oregon and east to Nevada. May-June.

Loc.—Amedee, *Jones.*

Var. **mohavensis** Crum comb. n. Robust, diffusely branching usually above base; leaves and bracts averaging larger; capsule less angular, rhombic-ovoid to obovoid, 2 to 2½ lines long; seeds usually 4.—Mohave Desert (Rabbit Sprs., *Jepson* 5941; Cushenbury Spr., *Jones*); Inyo Co. (Bishop, *K. Brandegee*). May–July.

Var. **stricta** Crum. var. n. Strictly branching from base; leaves and bracts much reduced; capsules ovate, 1 to 1½ lines long, often with short lateral processes; seeds usually 1 or 2.—(Caules stricti, a basi ramosi; folia multo reducta; bracteae parvae; capsulae ovatae, saepe lateraliter productae, lin. 1–1½ longae; semina plerumque 1 vel 2.)—Mohave Desert (Cushenbury Spr., *Jones*); Inyo Co. (Lone Pine, *Jones;* Big Pine, *R. S. Ferris,* type; Bishop, *Jones*). Aug.

Refs.—CLEOMELLA PLOCASPERMA Wats. Bot. King 33 (1871), type loc. Hot Sprs., Ruby Valley, Nev., *Watson* 135. Var. MOHAVENSIS Crum. *C. mohavensis* Payson, Univ. Wyo. Publ. Sci. Bot. 1:36 (1922), type loc. Rabbit Sprs., s. Mohave Desert, *Parish. C. oocarpa* Jepson, Man. 408 (1925), not Gray. Var. STRICTA Crum.

CLEOMELLA HILLMANII Nels. Proc. Biol. Soc. Wash. 18:171 (1905), type loc. Reno, Nev., *F. W. Hillman. C. longipes* var. *grandiflora* Wats. Bot. King 34 (1871), type loc. Truckee Valley, Nev., *Watson.* Near C. plocasperma; leaflets elliptic to oblong; racemes many-flowered, dense, 3 to 12 inches long, 1 to 3 inches wide; stipes ½ to ¾ inch long; capsules 2½ to 5 lines wide.—Fish Lake Valley, w. Mineral Co., Nev., *Shockley* 559, on the Cal. boundary.

5. **WISLIZENIA** Engelm.

Erect rank-scented annuals. Leaves with 3 leaflets and with minute deciduous bristles for stipules. Racemes dense, the green bracts much reduced or more commonly replaced by colorless filiform-subulate structures. Flowers yellow. Stamens with long much-exserted filaments. Stipe in fruit refracted upon the pedicel. Ovary with 2 ovules to each cell. Fruit 2-seeded and didymous, each valve closely contracted upon its seed and falling away with it, therefore like a nutlet.—Species 2, North America. (Dr. A. Wislizenius, who collected in early days in California.)

1. **W. refracta** Engelm. JACKASS CLOVER. Branching, 1 to 2 (or 6) feet high; leaflets obovate to oblong, 4 to 9 lines long, rather longer than the petiole; raceme dense, in age usually much elongated; petals 1½ lines long; stamens and ovary exserted; pods 1½ to 2 lines broad, the lobes strongly divergent and crested or toothed at apex, the cells separated by a partition with a single rather large perforation; stipe in fruit 2 to 4 lines long; style persistent and bristle-like; nutlets obovoid, usually reticulate and ridged and with coroniform tubercles or horns at summit, sometimes smooth.

Alkaline plains, 100 to 2300 feet: Sacramento to Lathrop and southward in the San Joaquin Valley as an immigrant; Colorado Desert. East to New Mexico and Texas. Apr.-Nov.

Variability of fruit.—A number of forms have been segregated as species from the original W. refracta Engelm., chiefly on the basis of differences in the shape and more especially differences in the tubercles on the fruit. The fruits are variable. In plants of the Great Valley the nutlets are somewhat ridged, somewhat reticulate and provided with a coronal crest of tubercles or warts. Sometimes again the warts are developed into horns. The tubercles or horns often differ in degree of development, on different plants, or the two nutlets on one fruit may sometimes be unlike. The fruits of the Great Valley plants do not differ essentially from those of the western Colorado Desert or of western Texas. On the other hand plants from the southern Mohave Desert at Twenty-nine Palms have the fruits almost smooth. The capsules are, however, unstable in these characters, and the plants on the whole so uniform and constant in every other, that we are disposed to look upon these peculiarities of the fruit as not useful for specific characters. Obovate and pyriform valves, for example, may occur on the same plant. Reticulations on obovate valves may be as distinct as in the case of the pyriform valves. The patterns of the ridges and reticulations, of the warts and horns, are of such a nature as to lead one to believe that the variations in the fruit represent sometimes differences in degree of development, sometimes fluctuating variability.

History of the species in the Great Valley.—In the San Joaquin Valley Wislizenia refracta is an introduction and was probably introduced during the early decades of the American occupation, since it had been noted as occurring there for a long period. A. L. Winchell, a local historical authority at Fresno, remembers the plant as growing in Fresno Co. on the west side of the San Joaquin River previous to 1870. Others recall the plant in that district for thirty years past. H. W. Shafer, an engineer of Selma, first observed the plant on Poso Creek east of Formosa in 1886, and also near Traver; he believes it to be an immigrant. From Goshen it was sent to us in 1900. In 1928 we noted it along the railway lines in Tulare Co. and observed its behavior on the alkali plains west of Fresno where it is very common. As observed north of Kerman, the plant seemed as if it had the habit of appearing initially along the roadways, thence spreading into the fields, especially moist ones broken by the plow. On the Fresno-Mendota road it continued to be more or less conspicuous on the plain as far west as the road station called Lone Willows. It is our view that this species is undoubtedly an introduction into the Great Valley from the southwards. In 1901 it was thought to be more common in the lower San Joaquin Valley than it had been formerly (cf. Fl. W. Mid. Cal. 230). It was not collected by Brewer, Bolander or any of the other early day collectors in the San Joaquin Valley. So conspicuous a plant could not well have been missed.

On account of the attraction that the flowers possess for insects, the plant has been noted by bee-keepers for many years. Under date of Nov. 18, 1900, O. L. Abbott writes from Selma: "In this district it is never called by any name other than Stinkweed. It grows best about six miles north of Goshen on ground white with alkali. Bumblebees, yellow butterflies and a very small bee are strongly attracted by its flowers, which indicates that it is a profuse yielder of nectar. I have never seen the honey bee on its blossoms." Contrariwise, other bee men (especially in recent years) regard this species as a valuable plant to the honey bee industry.

Locs.—Elk Grove, *Drew;* Lathrop, *Bioletti;* Fresno, *I. T. Walker;* Goshen, *O. L. Abbott;* Visalia, *Congdon;* Traver, *Jepson* 13,312; Twenty-nine Palms, s. Mohave Desert, *Jepson* 12,632; Borrego Valley, *J. T. Howell* 3237.

Refs.—WISLIZENIA REFRACTA Engelm.; Wisliz. Tour n. Mex. 99 (1848), type loc. El Paso, Tex., *Wislizenius;* Gray, Pl. Wright. 1:11, t. 2 (1852); Jepson, Fl. W. Mid. Cal. 230 (1901), ed. 2, 194 (1911), Man. 409, fig. 405 (1925). *W. californica* Greene, Proc. Biol. Soc. Wash. 19:130 (1906), type by Greene from the Great Valley (probably Lathrop, where he once collected it). *W. divaricata* Greene, Proc. Biol. Soc. Wash. 19:130 (1906), type loc. Borrego Sprs. (not "Bonego"), Colorado Desert, *Orcutt.*

6. **OXYSTYLIS** Torr. & Frem.

Annual. Leaves with 3 leaflets, long-petioled. Flowers in head-like axillary sessile clusters. Petals saffron yellow. Stamens separated from the petals on the elevated and somewhat fleshy receptacle. Ovary borne on a short stout stipe, retrocurved over the receptacle, didymously and unilaterally 2-lobed; ovules 2 to each cell. Fruit 2-seeded and didymous, the lobes obovoid, forming closed nutlets with thin soft covering and leaving a circular perforate scar where they separate from the corky thickened axis; style long, subulate, becoming indurated and spinescent. —Species 1. (Greek oxus, sharp, and stulis, column or style.)

1. **O. lutea** Torr. & Frem. Stem stout, erect, usually simple, 1 to 3 feet high, flowering from the base; leaflets oval, ¾ to 1½ inches long, on short (1 line long) petiolules; bracts subulate; petals elliptic, 1 line long; nutlets 1 line long; fruiting style spine-like, 3 to 4 lines long.

Sandy hollows in the hills, 100 to 2000 feet: Death Valley region. Mar.-Apr.

Gyno-monoecious condition.—The following facts have been worked out under our direction by Ethel Crum. "The lower heads are in most cases composed entirely of perfect flowers, the upper of pistillate flowers. On young plants, such as *J. T. Howell* 3619 (Bradbury Well, Black Mts.), all flowers seem to be perfect. Mixed heads are rare but one was found in a collection from the Amargosa Desert (*Jones*) and one in a collection from Salt Sprs. (*Parish* 9877). Other heads on these two plants are apparently pistillate. The gyno-monoecious condition seems best developed in very mature plants.

"Perfect flowers have the stamens much more advanced in development than the pistil which is very small in comparison. The torus is about .25 mm. high, bulbous on one side, the stipitate ovary inserted on the opposite side of the apex. In pistillate flowers of the same age, or even in unopened buds the pistil appears much better developed, the stipe and style are stouter, the latter more reflexed, and the lobes of the ovary much larger. The apex of the torus is less asymmetrical and the bulbous projection smaller in proportion to the size of the ovary. In some fully matured perfect flowers of lower heads with corolla expanded and stamens well exserted, the pistil appears so minute as to suggest that it never normally develops, so that an imperfectly monoecious condition results, the lower heads staminate, the upper pistillate. This view is corroborated by the fact that in plants from Clayton Valley, Nev., *Purpus* 6421, there remain old peduncles from which the flowers have fallen, but which have developed few or no spines and fruits. In cases where a few spines are present they adhere as tenaciously as in the normally fruiting heads. Of course an alternate explanation is that such flowers failed of fertilization."

Note on the fruit.—The flowering clusters are dense and there is very little expansion of the inflorescence in fruiting. Since the matured branches of the inflorescence, the fruit axes and the spines, are persistent, the fruiting inflorescences are, therefore, much congested, forming, with their spiny styles an involved burr-like body 1¼ to 1½ inches in diameter. The fruit consists of a pair of pendulous lobes borne strictly on one side of the axis. The lobes mature as nutlets which separate from the fruit axis by a circumscission just below the apex, the circumscission resulting in a small circular opening or scar in the top of the nutlet; there is also formed a similar characteristic scar on the fruit axis. Scattering of the nutlets is gradual, since those on the inside of the "burr", though becoming free by circumscission, are held by the complex rigid axes and spines, and only tardily released. Burs may retain some of the nutlets until the next year after maturity or until freed by weathering.

Locs.—Furnace Creek Cañon and Saratoga Sprs., Funeral Mts. (Contrib. U. S. Nat. Herb. 4: 68); Amargosa River at Zabriskie and Salt Spr. (Bot. Gaz. 65: 338); Bradbury Well, Black Mts., *J. T. Howell* 3619. Amargosa Desert, w. Nev., *Jones*.

Refs.—OXYSTYLIS LUTEA Torr. & Frem.; Frem. 2d Rep. 313 (1845), type loc. Amargosa River, *Fremont;* Jepson, Man. 409 (1925).

CRUCIFERAE. MUSTARD FAMILY

Herbs with alternate leaves, no stipules and the flowers in terminal bractless racemes. Sepals and petals each 4, regular and distinct. Petals commonly with claws, the blades spreading in the form of a cross. Nectar glands 4 (or sometimes fused in lateral pairs), papillate. Stamens 6, commonly tetradynamous (4 long and 2 short), sometimes subequal, sometimes 4 or 2. Ovary superior, 2-celled by a

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thin partition stretched between the opposite parietal placentae; ovules 1 to many, in 1 or 2 rows, in either case their funiculi always attached alternately right and left to the two placentae; style 1; stigma 2-lobed or entire. Fruit a 2-celled capsule, the 2 valves separating from below upwards, leaving behind the placentae and partition, or often 1-celled and indehiscent, or infrequently breaking up transversely into 1-seeded joints. Capsule long and narrow (a silique) or short and roundish (a silicle), commonly termed a pod and either terete, 4-sided, compressed (flattened parallel to the partition) or obcompressed (flattened contrary to the partition). Seeds in 1 or 2 rows in each cell. Embryo always curved, the caulicle folded upon the back of one of the cotyledons (incumbent) or along the edge of the cotyledons (accumbent).—Herbage always with the characteristic mustard-like or pungent juice. The petals are sometimes none. Some Streptanthus species have a somewhat irregular flower. Platyspermum has solitary flowers. Tropidocarpum has a leafy raceme.—Species 1500, all continents, both low and high altitudes, but mostly in temperate and arctic zones.

The early view of Lindley (Introd. Nat. Sys. 14,—1830) and the later one of G. Henslow (Trans. Linn. Soc. ser. 2, 1:191—1876) that the flower is 4-merous throughout, and not 2-merous as held by perhaps the majority of botanists, is confirmed (although on different grounds) and well established by recent investigations undertaken by Eames and Wilson on the character and course of the vascular bundles in the flower (Am. Jour. Bot. 17: 638–656, figs. 1–9,—1930). The contrasting theory of carpel polymorphism of Edith R. Saunders rests in the beginning upon research conducted upon Matthiola (Ann. Bot. 39:123–167,—1925), but extended to many other genera. An historical note on early views as to the nature of the Cruciferous flower is given in LeMaout and Decaisne, Sys. Bot. 229–230 (1873).

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1. Pods dehiscent by valves.

A. Pod a silique (linear-elongated to oblong, several times longer than wide).

Pods on a long stipe (5 to 10 lines long); flowers yellow........1. Stanleya.

Pods not stipitate, or on a very short or obscure stipe (½ to 1 line long).

Racemes leafless and bractless.

Pods not beaked or merely tipped with the persistent style (cf. one sp. in no. 2).

Stems from annual or perennial roots or root-crowns.

Valves 1- (or more) nerved.

Seeds in 1 row in each cell (except 2 species in no. 5 and several in no. 16).

Flowers yellow, or often white in nos. 4 and 5.

Leaves dissected or pinnatifid, or some at least lobed; flowers small.

Pods terete.

Annuals........5. Sisymbrium.

Perennials........4. Halimolobus.

Pods somewhat quadrangular, pointed; perennial........11. Barbarea.

Leaves entire or merely dentate, at least not lobed; flowers large, orange or yellowish........17. Erysimum.

Flowers white or whitish (rarely yellowish) to purple or purplish.

Petals with a broad limb, not crisped or twisted.

Pod teretish; flowers white or pale yellow; leaves pinnately divided into small segments; tufted perennial........15. Smelowskia.

Pods flattened; leaves dentate or entire, a few species pinnately divided or lobed.

Pods not horned at apex; seeds winged or wingless........16. Arabis.

Pods 2-horned at apex; seeds winged....18. Matthiola.

Petals commonly with narrow limb.

Sepals mostly greenish; petals white or yellowish, rarely purple or roseate, the blade not crisped; filaments distinct; stigma entire or obscurely 2-lobed; pods terete or nearly so; seeds not winged........3. Thelypodium.

Sepals mostly colored, commonly purple; petals purple or white, rarely yellow, the blade often crisped, often narrower than the claw; filaments distinct or the upper pair connate and sometimes the lower pair; stigma entire to deeply 2-lobed; pods flattened; seeds winged or wingless........2. Streptanthus.

Seeds in 2 rows in each cell.

Pods terete; flowers yellow or white........12. Radicula.

Pods strongly flattened; flowers purplish........19. Parrya.

Valves not nerved; leaves pinnate........13. Cardamine.

Stems from tuberous rootstocks, naked below; flowers white........14. Dentaria.

Pods produced into a beak beyond the valves; embryo with conduplicate cotyledons; flowers yellow; nectar glands 4.

Pods terete; seeds in one row in each cell........9. Brassica.

Pods somewhat compressed; seeds in two rows in each cell........10. Diplotaxis.

Racemes leafy; leaves pinnatifid; annual........20. Tropidocarpum.

B. Pod a silicle (globose, orbicular or oblong, about 1 to 3 times as long as wide).

Pods not turgid.

Pods flattened parallel to the broad partition.

Flowers in racemes; seeds not winged.

Pod 1 or 2-seeded; low altitudes........29. Alyssum.

Pod many-seeded; seeds in 2 rows in each cell; mostly alpine or subalpine........32. Draba.

Flowers solitary on naked scapes; seeds with a broad membranous wing........28. Platyspermum.

Pods flattened contrary to the narrow partition.

Seeds 2 to several in each cell.

Herbage glabrous; leaves undivided........24. Thlaspi.

Herbage pubescent; leaves pinnately incised or parted.

Flowers white, 1 line long; pods 1 to 4 lines long........30. Capsella.

Flowers purplish, 6 lines long; pods 3 to 9 lines long........21. Lyrocarpa.

Seeds solitary in each cell.
  Pods regularly dehiscent.
    Pods with tomentose valves and cord-like margins, notched both at base and apex....23. DITHYRAEA.
    Pods with glabrous or pubescent valves, notched or obtuse at apex, not notched at base, winged or not winged at apex....26. LEPIDIUM.
  Valves of the pods falling as closed or nearly closed nutlets, very rugose....25. CORONOPUS.
Pods more or less turgid.
  Terrestrial plants.
    Pods subglobose or obovate; herbage pubescent....22. LESQUERELLA.
    Pods pear-shaped with a narrow margin; herbage glabrous or nearly so....31. CAMELINA.
  Aquatic plants; pods oblong; leaves linear-subulate....27. SUBULARIA.

II. Pod indehiscent or at least not dehiscent by valves.

Pods elongated, at length breaking transversely into 1-seeded indehiscent joints.
  Flowers showy; pod several-seeded, commonly with constrictions between the seeds....8. RAPHANUS.
  Flowers small; pods 2-seeded, jointed in the middle....7. CAKILE.
Pods flattened, orbicular to obcuneate, 1-seeded, wholly indehiscent.
  Pods margined all around with a wing; stems mostly erect.
    Flowers in long racemes; pods orbicular....34. THYSANOCARPUS.
    Flowers crowded in rather short racemes, the racemes corymbose-paniculate; pods elliptical....6. ISATIS.
  Pods not winged; stems slender, diffuse....33. ATHYSANUS.

1. STANLEYA Nutt.

Tall perennial or biennial herbs, or sometimes suffrutescent, with coriaceous, glabrous and often glaucous leaves. Flowers numerous in showy elongated spike-like racemes. Calyx in bud long, cylindric; sepals linear or narrowly spatulate, spreading or reflexed in anthesis. Stamens equal; anthers basifixed, linear, curved or in age tightly coiled; filaments long-exserted. Stigma small, sessile on the summit of oblong-clavate thickened style, the thickened portion with a longitudinal furrow. Pod linear-elongated, terete, long-stipitate, its valves 1-nerved; seeds in one row; cotyledons incumbent.—Species 5, arid western North America. (Lord Edward Stanley, English ornithologist, first half 19th century.)

Style short-hairy near base; petals much exceeding sepals, bright lemon-yellow, the claw woolly; leaves chiefly cauline, mostly pinnatifid, only the uppermost entire....1. *S. pinnata.*
Style wholly glabrous; petals about equaling sepals, light yellow, glabrous throughout; leaves chiefly basal, all entire or subentire....2. *S. elata.*

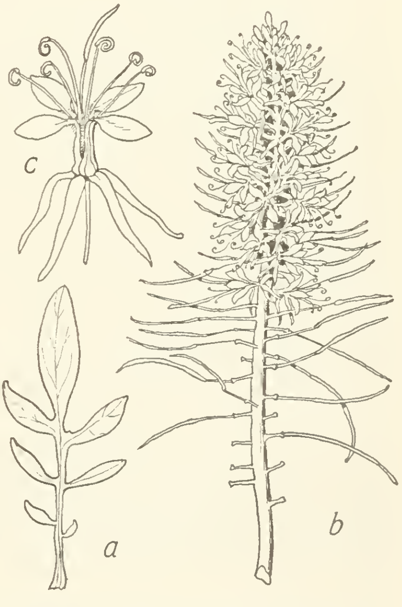

Fig. 128. STANLEYA PINNATA Britt. *a*, basal leaf, × ¼; *b*, infl., × ¼; *c*, fl., × ¾.

1. **S. pinnata** Britt. DESERT PLUME. (Fig. 128.) Plants 2 to 5 feet high, the long solid erect branches from stout woody bases 4 to 6 inches high; herbage glabrous; leaves glaucous, variable, blades of the lower commonly coarsely lyrate-pinnatifid or sometimes entire, 3 to 7 inches long, long-petioled, blades of the upper less divided, or lanceolate and entire, short-petioled; racemes ⅓ to 2 feet long; pedicels 2 to 4 lines long; sepals greenish-yellow; petals bright yellow, the oblong limb 2½ to 4 lines

long, the claw woolly-pubescent, as long or longer than blade, and dilated downwards; filaments puberulent toward base; pods 1½ to 2½ inches long, a line wide, spreading, curved like a sickle; stipe 5 to 10 lines long.

Dry plains and foothills, 1000 to 4500 feet: Mohave Desert, west to Santa Barbara Co., north to the upper San Joaquin Valley and Inyo Co. East to Nebraska and Texas. May–June.

Field note.—Remarkably capparidaceous in habit and in certain points of flower structure, this plant is a very interesting species phylogenetically. It is not uncommon in certain localities in the Mohave Desert. We are now trailing in a southerly direction over a pass at the west end of Ord Mt. and find a dry lake bed, the lower part of it occupied by Atriplex canescens Nutt. About five acres of the bed are in high color, filled with handsome round many-stemmed plants of Stanleya pinnata four to six feet high, the finest we have yet seen.—Jepson Field Book, vol. 30: p. 79 (1914), ms.

Biol. note.—The tops of the shrubs are winter-killed and only the basal 1 or 2 feet are truly woody. The leaf buds are wholly lateral, develop rosettes which burst in February, and are borne almost exclusively on the lower portion of the simple slender flowering shoots of the previous season, and only to a slight degree on older wood. A trunk stem from the Calico Wash north of Daggett (*Jepson* 6597) is 1¼ inches in diameter and ten years old. Some of the capsules dehisce tardily throughout the winter.—Jepson Field Book, vol. 32: p. 44 (1916), ms.

Locs.—Santa Maria, *Ida Blochman;* Cuyama Valley, *Jepson* 12,162; Soledad Cañon, Los Angeles Co., *Barber* 179; Rock Creek, *Peirson* 292; Rabbit Sprs., *S. B. & W. F. Parish* 132; Pleasant Valley, Hexie Mts., *Clary* 1491; Cottonwood Spr., ne. of Mecca, *Jepson* 12,560; Calico Wash, n. of Daggett, *Jepson* 5384; Ord Mt., *Jepson* 5937; Summit sta., e. of Haloran Spr., e. Mohave Desert, *Jepson* 15,816; Ash Creek, Owens Lake, *Jepson* 5129; Emigrant Cañon, Death Valley, *Jepson.*

Refs.—STANLEYA PINNATA Britt. Trans. N. Y. Acad. Sci. 8:62 (1888); Cov. Contrib. U. S. Nat. Herb. 4:64 (1893); Jepson, Man. 411 (1925). *Cleome pinnata* Pursh, Fl. 2:739 (1814), type loc. upper w. Mississippi Valley, *Bradbury. S. pinnatifida* Nutt. Gen. 2:71 (1818), Missouri River, *Nuttall;* B. & W. Bot. Cal. 1:38 (1876).

2. **S. elata** Jones. PANAMINT PLUME. Stems solid, 2 to 6 feet high, scape-like or branching toward the summit; leaf-blades lance-ovate, entire or divided at base into a few lobes or well-defined divisions, 4 to 10 inches long, as much as 3½ inches broad, narrowed at base to a short petiole or in upper leaves petiole half as long as blade; racemes 6 to 15 (or 24) inches long; sepals petal-like, broad-membranous at base, slightly enlarged upwards to an oar-like blade 2 lines wide; petals light yellow, about equaling the sepals but narrower and less conspicuous, blade reduced, crisped; filaments short-hairy on the lower half; pods filiform, 3 to 4 inches long, ½ line in diameter.

Washes of mesas and cañons of desert ranges, 5000 to 6500 feet: Argus, Panamint and White mountains, Inyo Co. Northerly to western Nevada. May-June.

Locs.—Argus Mts., *Jones;* Inyo Mts., and betw. Darwin and Keeler (Contrib. U. S. Nat. Herb. 4:64); betw. Wild Rose Cañon and Emigrant Wash, Panamint Mts., *Ferris* 7999; Black Cañon, White Mts., *Duran* 2693.

Refs.—STANLEYA ELATA Jones, Zoe 2:16 (1891), type loc. near Hawthorne, Mineral Co., Nev., *Jones;* Jepson, Man. 411 (1925).

STANLEYA VIRIDIFLORA Nutt. In the two preceding species the stem leaves are petioled and the stamens twice or nearly thrice the length of the petals. In S. viridiflora Nutt. (T. & G. Fl. 1:98,—1838, type loc. Ham's Fork, Colorado River; Jones, Zoe: 3:283,—1893) the stem leaves are clasping and the stamens not exceeding the petals. A form of it has been found near the California boundary at Candelaria, Esmeralda Co., Nev.

2. STREPTANTHUS Nutt.

Annual herbs, or some biennial or perennial. Basal leaves commonly toothed or pinnatifid, the cauline similar or entire, often sagittate-clasping. Calyx with 2 of the sepals or all saccate at base, the calyx thus ovoid or broad at base and contracted above, or by the spreading of the tips becoming somewhat flask-shaped;

or not at all saccate but subcylindric. Petals purple, white, pinkish, or rarely pale yellow, commonly with a narrow undulate or crisped limb and channeled claw, the upper pair sometimes longer (as in no. 21). Stamens tetradynamous, or in 3 unequal pairs, the filaments all distinct, or the longer pairs united, or only the upper pair united. Pod narrowly linear, flattened parallel to the partition; valves 1-nerved or rarely carinate. Seeds in one row, flat, winged or wingless.—In S. californicus the pods are obcompressed. Species about 35, western North America and Mexico. (Greek streptas, twisted, and anthos, flower, in reference to the petals.)

Evidence in regard to the validity of the genus Caulanthus.—Of the various species which compose the genus Caulanthus of Watson (Bot. King 27) C. inflatus has been considered a good biological representative. It has been referred to Caulanthus by all authors who have accepted Caulanthus as a genus. It is, however, in every particular of flower structure like various dominant types of Californian Streptanthi, such as S. glandulosus Hook. The fruits are essentially similar save that the stigma is 2-lobed in Caulanthus inflatus as opposed to the entire stigma of Streptanthus glandulosus. But other Caulanthus species (such as C. pilosus Wats.) are quite intermediate in this particular. A study of the sum total of the characters of the most representative or central types of Californian Streptanthi and of the dominant types of Caulanthus indicate, to our mind, that these species are closely derived from one generic type. Phylogenetic considerations point to the arrangement of these forms under one genus name.

There are other more or less outlying species, study of which lends weight to this judgment. Streptanthus heterophyllus Nutt. is, as a species, very near to Caulanthus coulteri Payson. In this connection Streptanthus insignis Jepson (based on a specimen collected at Waltham, w. Fresno Co., *Eastwood*, as a type) affords evidence of value from a genetic standpoint. Its flower characters are to so remarkable a degree those of Streptanthus glandulosus Hook. that not a few careful botanists have distributed specimens of it under this name. The stigma, however, is evidently 2-lobed, rather slightly, to be sure, but still obviously; while that of S. glandulosus is entire. The latest flowers of the raceme in Streptanthus insignis are sterile, very congested and black-purple, and so form a terminal color spot. No terminal black spot is found in the racemes of S. glandulosus but it appears again in Caulanthus coulteri. Streptanthus insignis is, in our opinion, rather nearer Caulanthus coulteri than it is to Streptanthus glandulosus.

Therefore on account of the lack of any real cleavage between Streptanthus and Caulanthus, most species, especially the typical ones, are here referred to Streptanthus. Such an arrangement as we give below is believed to be more in consonance with the probable phylogeny.

Certain species require special consideration. For example: Streptanthus longirostris Wats., in our concept of the genera Streptanthus and Thelypodium, goes to the latter genus because of its resemblance to T. lasiophyllum Greene. Like that species or forms of that species, its pods are very slender, more or less rigid, and divaricate-spreading, with the pedicels very short (only about one-half line long).

A paper by E. B. Payson entitled "A Monographic Study of Thelypodium and its Allies" (Ann. Mo. Bot. Gard. 9:233–324,—1922) includes an account of Caulanthus; it is well written, it is vigorous and progressive in treatment, and admirably considered. The author did not, however, include Streptanthus in his investigation. In our judgment Caulanthus and Streptanthus are so close that any decisions fail in effectiveness if either be ignored.

Bibliog.—Gray, A., On Streptanthus and the plants which have been referred to that genus (Proc. Am. Acad. 6:182–188,—1864). Greene, E. L., Certain West American Cruciferae (Lflts. 1:81–90,—1904); Four Streptanthoid genera (Lflts. 1:224–229,—1906).

A. Stigma 2-lobed; petals plane or somewhat crisped; stem erect, simple or branched; seeds mostly wingless, sometimes narrowly winged.

Cauline leaves petioled; stamen filaments of equal length, all distinct.—Subgenus CAULANTHUS.
  Herbage not glabrous; stem commonly branching, leafy up to the inflorescence; leaves coarsely toothed or pinnatifid.
    Petals almost included in the calyx; sepals purple; flower buds oblong, glabrous; biennial .... 1. *S. pilosus.*
    Petals distinctly longer than the sepals; sepals pale or whitish; flower buds elliptic-ovate, hispidulose; annual .... 2. *S. hallii.*
  Herbage glabrous; stem naked above the base or bearing a few reduced or bract-like leaves.
    Leaves entire; stem branching; calyx glabrous; perennial .... 3. *S. glaucus.*
    Lowest leaves mostly lyrate-pinnatifid.
      Calyx densely white-woolly; stem simple, strongly inflated; annual .... 4. *S. crassicaulis.*
      Calyx glabrous; stems 1 or several from the base, simple, rarely inflated; perennial. 5. *S. major.*

Cauline leaves sessile, auriculate-clasping; stamen filaments in pairs, of unequal length; annuals.—Subgenus Paracaulanthus.
Stamens with the filaments all distinct.
Basal leaves more or less obovate, dentate.
Flowers erect or spreading.
Pedicels glabrous; raceme with few remote flowers; flowers purplish; pods erect or ascending..6. *S. amplexicaulis.*
Pedicels hirsute; raceme with several flowers; flowers yellowish; pods mostly reflexed..7. *S. simulans.*
Flowers pendulous; pedicels hispidulose...8. *S. californicus.*
Basal leaves oblong or linear, saliently lobed; pedicels bristly........................9. *S. insignis.*
Stamens with 1 or 2 pairs of filaments connate.
Filaments of 1 (rarely 2) pair of stamens connate; pods mostly descending; stem not inflated..10. *S. coulteri.*
Filaments of 2 pairs of stamens connate; pods erect; stem inflated or very succulent. 11. *S. inflatus.*

B. Stigma circular and entire or only shortly 2-lobed; petals crisped with channeled claw, the limb crisped, usually narrow.

Filaments of all the stamens distinct; plants all erect, or sometimes diffuse in nos. 15 and 16.—Subgenus Pleiocardia.
Plants glabrous and glaucous.
Branches of inflorescence without bracts; cauline leaves auriculate-clasping at base; sepals dull purplish or green, apex slightly bearded; petals with ovate claw contracted above to a ligulate limb; stamens nearly equal; pedicels less than 3 lines long; perennials.
Flowers 3 to 4 lines long; pods 1 line broad.
Cauline leaves broadly oblong to lanceolate, with auriculate base, not crowded.. 12. *S. campestris.*
Cauline leaves cordate, crowded on the stem...................................13. *S. barbatus.*
Flowers 5 to 6 lines long; pods 2 lines broad; cauline leaves cordate-ovate or -oblong..14. *S. cordatus.*
Branches of inflorescence bearing round- to lanceolate-cordate bracts; petals with expanded limb; stamens in 3 unequal pairs; annuals (except 2 varieties of no. 15).
Lower leaves oblong-spatulate, crenately toothed or lobed; mostly montane.
Pods recurved-spreading; plants ⅓ to 3 or 4 feet high; common, of wide range...15. *S. tortuosus.*
Pods erect; plants 2 to 7 inches high; rare and local.......................16. *S. gracilis.*
Lower leaves pinnately divided, the segments linear-filiform.........17. *S. diversifolius.*
Plants hispid; leaves linear to oblong, the lobes or teeth commonly salient.............................. 18. *S. heterophyllus.*
Filaments of upper pair of stamens connate, bearing reduced anthers; inflorescence non-bracteate; petals with linear obtuse crisped limb; erect annuals.—Subgenus Euclisia.
Plants glabrous and often glaucous.
Calyx with the sepals in pairs, the outer pair sub-orbicular with upper sepal banner-like, exceeding other flower parts, the inner or lateral pair ovate, acute........................ 19. *S. polygaloides.*
Calyx with the upper sepal not banner-like.
Pods usually somewhat torulose; calyx regular or nearly so.
Leaves broad; petals in dissimilar pairs...20. *S. breweri.*
Leaves narrow; petals in similar pairs...21. *S. barbiger.*
Pods not torulose; calyx with the 3 upper sepals approximate or connivent at tip, the lower one free; corolla irregular...22. *S. niger.*
Plants hispid, at least below.
Calyx commonly glabrous; plants erect.
Racemes loose; 3 upper sepals approximate or connivent at tip, the lower free; pods ascending...23. *S. glandulosus.*
Racemes dense, secund; 2 upper sepals approximate or connivent; pods recurved or drooping...24. *S. secundus.*
Calyx more or less hispid, with sepal tips distinct and free; plants bushy-branched.......... 25. *S. hispidus.*

1. **S. pilosus** Jepson. Biennial; stem simple or branched sparingly, 1¾ to 3½ feet high; herbage mainly glabrous but the lower parts densely hispid; leaf-blades pinnately parted into ovate or oblong lobes (the lobes irregularly lobed or

toothed), 1¼ to 5 inches long, the petioles about half as long; raceme lax; flowers 4 to 5 lines long; sepals elliptic, green or purple, white-membranous-margined; petals whitish, the limb very narrow, acute, scarcely exserted; pods slender, flexuous, ascending or widely divaricate, 2½ to 5 inches long; pedicels 2½ to 4 lines long.

Sandy soil, deserts, 4600 to 6000 feet: Inyo Co. East to Nevada, north to Oregon and Idaho. Apr.-May.

Locs.—Darwin Valley, *Jones;* Lone Pine Creek; Bishop, *Heller* 8295. Candelaria, Nev., *Shockley* 5.

Refs.—STREPTANTHUS PILOSUS Jepson, Man. 415 (1925). *Caulanthus pilosus* Wats. Bot. King 27 (1871), based on specimens from the Truckee Valley and Humboldt Lake, Nev., *Watson.*

2. **S. hallii** Jepson comb. n. Annual; stem erect, 2 to 5 feet high, branching from the base upward, the branches erect; herbage glabrous or nearly, save that the lower leaves are hirsutulose or hispidulose with few scattered hairs; leaves chiefly basal or sub-basal, 2 to 7 inches long, the blades pinnately parted with salient or angular lobes, or irregularly pinnatifid, the lowest petioled, the upper ones reduced, their blades linear or lanceolate, entire or subentire, sessile, not auriculate; racemes very loose, several to many-flowered, the flowers ½ to 1½ inches apart; flower buds elliptic-ovate, hispidulose; flowers 3½ lines long; pedicels and calyx sparsely hirsute or bristly; sepals whitish, pilose; petals white, somewhat constricted between claw and limb; pods curved or flexuous, widely spreading or ascending, 3½ to 4½ inches long; stigma cupulated rather than 2-lipped.

Hill slopes and cañons, 2000 to 5200 feet: desert slope of mountain ranges bounding the Colorado Desert on the northwest and west, from the Lookout Mt. region to the Balcan Mts. Apr.

Locs.—Piñon Well n. of Indio, *Jepson* 6002; Coyote Cañon, Santa Rosa Mts., *Hall;* San Felipe, *T. Brandegee.*

Refs.—STREPTANTHUS HALLII Jepson. *Caulanthus hallii* Payson, Ann. Mo. Bot. Gard. 9:290 (1922), type loc. Coyote Cañon, Santa Rosa Mts., *Hall* 1165.

3. **S. glaucus** Jepson. Stem stout, branching, 1 to 1½ feet high, arising from a perennial root; herbage glabrous, glaucous; leaf-blades orbicular to roundish-obovate or ovate, entire or subentire, ¾ to 3½ inches long, the upper lanceolate, all on petioles ⅓ to ⅔ as long; flowers 5 to 5½ lines long; sepals oblong or elliptic, ½ to ¾ as long as the petals; petals greenish, the limb plane, nearly erect, about as long as and obviously narrower than the broad claw; pods slender, 3 to 6 inches long, on pedicels 3 to 5 lines long.

Rocky slopes in the desert, 5000 to 7500 feet: White Mts. East to Nevada. June.

Tax. note.—In this unique species the root-crown is sometimes quite woody and the stems a little inflated. The foliage is slightly succulent; the stigma is bifid.

Locs.—Silver Cañon, White Mts., *Jepson* 7212, 7221 (root distinctly perennial), *Duran* 1513. Candelaria, w. Nev., *Shockley;* Gold Mt., Nev., *Purpus* 5974.

Refs.—STREPTANTHUS GLAUCUS Jepson, Man. 415 (1925). *Caulanthus glaucus* Wats. Proc. Am. Acad. 17:364 (1882), type loc. Candelaria, Esmeralda Co., Nev., *Shockley.*

4. **S. crassicaulis** Torr. Annual; stem simple, strongly inflated, 1½ to 3¼ feet high, the leaves mainly in a basal tuft, the cauline few and reduced; herbage glabrous; leaf-blades ovate or oblong and obtuse to lanceolate and acute, entire above, but with 1 or 2 pairs of salient oblong or linear lobes at or towards the base, 1 to 3 inches long, the petioles 1 to 1½ times as long, sometimes bearing one or two supplementary leaflets; flowers 5 to 7 lines long, spreading on pedicels ½ to 1 line long; calyx densely white-woolly, sometimes glabrate in age and then purple; petals dark purple, white-margined; pods slender, terete, ascending, 3½ to 4¾ inches long.

Desert gulches or gravelly slopes, 5000 to 7500 feet: Inyo Co. East to Utah. May–June.

Locs.—Wyman Creek, White Mts., *Duran* 1925; Nelson Range, *Hall & Chandler* 7160. Miller Mt., Esmeralda Co., Nev., *Shockley* 252; Gold Mt., Nev., *Purpus* 5992; Good Sprs., Clark Co., Nev., *K. Brandegee*.

Refs.—STREPTANTHUS CRASSICAULIS Torr.; Stansb. Expl. Great Salt Lake 384, pl. 1 (1852), type loc. mountain side, e. shore Salt Lake, Utah, *Stansbury*. *Caulanthus crassicaulis* Wats. Bot. King 27 (1871).

5. **S. major** Jepson. (Fig. 129.) Stems 1 or few from a leafy-tufted perennial root-crown, simple, 1 to 2 feet high, the cauline leaves few and reduced or almost none; herbage glabrous; leaf-blades oblong to lanceolate, mostly obtusish, entire above, but with 1 or 2 pairs of lobes at base, or merely dentate, or wholly entire, 1 to 2 inches long, on petioles about as long; flowers glabrous, ascending, 5 to 6 lines long, on pedicels ½ line long; calyx blue-purple; limb of petals short, little exserted, with a central dark purple-veined area and broad white margins; pods erect, 3½ inches long.

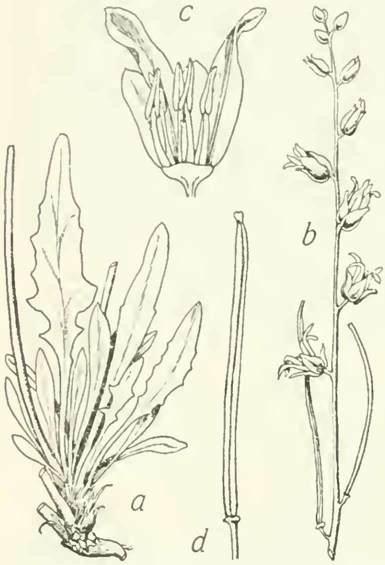

Fig. 129. STREPTANTHUS MAJOR Jepson. *a*, base of plant, × ⅓; *b*, infl., × ⅓; *c*, long. sect. of fl. showing stamens, × 1½; *d*, pod, × ½.

Desert slopes, 5500 to 7000 feet: ranges in and bordering the Mohave Desert. East to Utah. May-June.

Locs.—This species is well marked in habit. The stems are stout or at some stations inflated. Infrequent in California, the following are the only localities known to us: Rock Creek, *Peirson* 65; Mt. San Antonio (n. slope); San Bernardino Mts. (n. slope), *Parish* 3777; Providence Mts., *T. Brandegee*.

Refs.—STREPTANTHUS MAJOR Jepson, Man. 415 (1925). *Caulanthus major* Payson, Ann. Mo. Bot. Gard. 9:291 (1922). *C. crassicaulis* var. *major* Jones, Proc. Cal. Acad. ser. 2, 5:623 (1895), type loc. Bromide Pass, Henry Mts., Utah, *Jones* 5685.

6. **S. amplexicaulis** Jepson. Annual; stem very slender, a little flexuous, 7 to 12 inches high; herbage glabrous and more or less glaucous, especially on the under side of the leaves; leaf-blades broadly obovate to elliptic-oblong, shallowly sinuate-dentate and obtuse, somewhat narrowed at base or subpetiolate, 1 to 3½ inches long, the upper auriculate- or cordate-clasping, entire, acute; flowers few and remote in the raceme, purplish, ascending; pedicels 3 to 6 lines long, spreading; pods slender, erect or ascending, 3 to 4½ inches long.

Montane slopes, in dry ground or rocky places, 1500 to 8500 feet: San Bernardino and San Antonio mountains, north to the western Mohave Desert. May-June.

Locs.—Waterman Cañon, San Bernardino Mts., *Parish;* Mt. San Antonio, *Peirson* 64; San Francisquito Pass; Manzana, Antelope Valley, *Davy* 2563.

Refs.—STREPTANTHUS AMPLEXICAULIS Jepson, Man. 417 (1925). *Caulanthus amplexicaulis* Wats. Proc. Am. Acad. 17:364 (1882), type loc. San Bernardino Mts., *S. B. & W. F. Parish* and *W. G. Wright*. *Euclisia amplexicaulis* Greene, Lflts. 1:84 (1904).

7. **S. simulans** Jepson. Annual; stem simple or branching from the base, 1 to 1¾ feet high; herbage hispid below, glabrous above or with a few scattered hairs; basal leaves obovate to oblong-oblanceolate, dentate, ¾ to 1½ inches long, scarcely petioled, the cauline linear-oblong or lanceolate, dentate, sagittate-clasping; flowers yellowish, 4 lines long; pedicels hispid, ½ to 1½ lines long; pods reflexed or descending, 1¾ to 2 inches long; stigma 2-lobed.

Mountain slopes, 1600 to 5000 feet: San Jacinto Mts. to Volcan and Cuyamaca mountains. Mar.-Apr.

Locs.—The segregation of this species we owe to the late E. B. Payson. Unlike Streptanthus heterophyllus and S. hallii, it is found on both slopes of the mountain range which lies between the Colorado Desert and coastal Southern California. Its flower-buds, oblong or oblong-ovate, are either glabrous or sparsely hirsute. The following stations validate the indicated range: Winchester; Elsinore to Menifee, *Alice King;* Coyote Cañon, *Jepson* 1428; San Felipe, *T. Brandegee;* Cuyamaca, *T. Brandegee.*

Refs.—STREPTANTHUS SIMULANS Jepson, Man. 417 (1925). *Caulanthus simulans* Payson, Ann. Mo. Bot. Gard. 9:295 (1922), type loc. Coyote Cañon, *Hall* 1894.

CAULANTHUS STENOCARPUS Payson, Ann. Mo. Bot. Gard. 9:300 (1922), type loc. Bernardo, San Diego Co., *Abrams* 3364. Flowers pendent; sepals purple; stigma nearly entire, very small (ex char.). It is said to be nearest Streptanthus simulans.

8. **S. californicus** Greene. Annual; stem branching from the base, 8 to 12 inches high; herbage glabrous (or with a few scattered bristles below); basal leaves 2 to 3½ inches long, broadly oblong, strongly crenate, gradually narrowed downward to a winged petiole ⅒ to ⅓ as long as the blade; cauline leaves oblong to oblong-ovate, cordate-sessile, dentate, 1 to 2 inches long; pedicels hispidulose, 1 to 3 lines long; flowers pendulous, 3 to 4 lines long; sepals purple-tipped, white-membranous below; petals narrow, wavy-margined; pods obcompressed and strongly flattened, somewhat sword-like, erect or pendulous, 1 to 1½ inches long, 2½ to 3¼ lines wide; style 1 to 1¾ lines long; stigma 2-lobed.

Plains and hill slopes, 400 to 2000 feet: upper San Joaquin Valley and the bounding inner Coast Range. Mar.-Apr.

Tax. note.—This species, Streptanthus californicus, is the type of Sereno Watson's monotypic genus Stanfordia (Bot. Cal. 2:479,—1880). It is a very remarkable plant of highly localized occurrence and is in general quite uncommon throughout its range, though extremely abundant in the restricted colonies where it grows. Such colonies are found on valley flats or cañon sides and occupy more or less circular areas 4 to 80 yards across. These areas are exclusively occupied by this species or at least it is the dominant and imparts, when in flower, a marked character to the scene. The pod is "somewhat laterally compressed" according to Watson, and is often described as thick or subterete, but we find it strongly flattened contrary to the partition, more or less lanceolate just before maturity, but gladiate when mature (cf. spms. from Zapato Chino Creek, sw. Fresno Co., *T. Brandegee*). The pods are straight or curved, even on the same axis; and when half-grown, it is highly interesting to note, they are curiously vermiform-contorted just as in S. coulteri. In a small colony on the Carrizo Plain opposite the Panorama Hills, where the plants were obviously of one lineage, we noted that the main flowering axes of some plants bore deflexed pods, others bore ascending pods, others, still, bore spreading pods, and yet again there were some plants with pods ascending or deflexed on the same axis. The distinctive corolla is immediately pendulous; the sepals are strongly carinate, whitish on lower half, yellowish-brown on upper half; the corolla scarcely exceeds the sepals; the petals are typically streptanthoid, narrow, greenish-yellow with narrow white wavy margins; the upper pair of petals spread right and left, the lower pair are parallel and turned downward. The buds are large, deep velvety purple, strongly 4-angled and 4-winged, in this respect resembling S. coulteri. About 1½ miles south of the station last noted there were discovered a few more colonies about one-eighth mile wide.

The most remarkable character of this plant resides in the embryo with its trifid cotyledons. Greene (Fl. Fr. 256) reduced Stanfordia to Streptanthus, on the basis of the similarity of its flowers to S. inflatus, a reduction accepted by the present author in the Manual of Flowering Plants of California, 417 (1925). Payson (Ann. Mo. Bot. Gard. 9:300) reduced it to Caulanthus and says of the deeply trifid cotyledons that they "are remarkable and without parallel in the genus Caulanthus." However, we find that in certain specimens of Streptanthus (Caulanthus) coulteri the embryos have trifid cotyledons, as for example in the following: Greenhorn Range, *Hall & Babcock* 5077; Orosi, Tulare Co., *Harriet Kelley;* e. of Orosi, *Harriet Kelley.*

All the habital and flower characters indicate close genetic connection of Stanfordia with Streptanthus coulteri and its var. lemmonii and related species; and we, therefore, retain it in Streptanthus. The embryo, while very remarkable, is not unique, though the structure of the fruit imparts to the species a marked, almost impressive character. Sereno Watson's faith in his genus may have wavered slightly, since he writes, on May 8, 1884, to E. L. Greene, "I would like to have you find a second species of the Stanfordia."—Jepson, Botanical Letters of Other Days, 43 (ms).

Locs.—Bakersfield, *Greene;* Delano, *Otto Steinwand;* Deer Creek, Tulare Co., *Congdon;* Tulare (Fl. Fr. 256); Huron, Fresno Co., *T. Brandegee;* Alcalde Cañon (n. side); Zapato Chino Creek, *T. Brandegee* (Zapato Chino Creek is the full name of Zapato Creek, a winter water course on the east slope of the Diablo Range, sw. Fresno Co.); Lost Hills (5 mi. e.), *Mason;* Carrizo Plain, opp. Panorama Hills, se. San Luis Obispo Co., *Jepson* 16,214.

Refs.—STREPTANTHUS CALIFORNICUS Greene, Fl. Fr. 256 (1891); Jepson, Man. 417 (1925). *Stanfordia californica* Wats. Bot. Cal. 2:479 (1880), type loc. near Tulare, *Mrs. A. E. Bush. Caulanthus californicus* Payson, Ann. Mo. Bot. Gard. 9:299 (1922).

9. **S. insignis** Jepson. Annual; stem branching from near the base, ⅓ to 1½ feet high; herbage bristly-pilose; raceme with a dense terminal cluster of sterile flowers forming a conspicuous black spot; pedicels bristly-hispid; calyx sparsely but markedly bristly-hispid; stigma evidently 2-lobed; pods bristly-hispid, erect or reflexed.

Stony mountain slopes, 1500 to 2500 feet; inner South Coast Range from San Benito Co. to w. Fresno Co. Apr.-May.

Tax. note.—While the stigma of Streptanthus insignis is only slightly 2-lobed, yet the lobation is obvious. This species is probably a mutant from S. coulteri Greene. It is, in any event, on the one hand, by reason of its hairy pedicels, the terminal "black spot" on the raceme, and its stigma, closely related to S. coulteri; and we believe that it is, on the other hand, related to S. glandulosus var. pulchellus Jepson by reason of its flowers. We find that collectors have distributed specimens of S. insignis under the name S. pulchellus Greene, but that plant has a circular and quite entire stigma. The genetic position of Streptanthus insignis is, indeed, strikingly intermediate between S. coulteri Greene and S. glandulosus Hook., though nearer the former, and gives further weight to the soundness of the position we here hold that these two species, Streptanthus glandulosus Hook. and Streptanthus coulteri Greene (Caulanthus coulteri Wats.), do not belong to different generic units.

Locs.—Se. San Benito Co., *Hall* 9941; Warthan, w. Fresno Co., *Eastwood;* Pinnacles, Monterey Co., *A. J. Pieters* (some of the pods glabrous, the filaments distinct).

Ref.—STREPTANTHUS INSIGNIS Jepson, Man. 420 (1925), type loc. Warthan, w. Fresno Co., *Eastwood.*

10. **S. coulteri** Greene. Annual; stem simple or branching, 1 to 3 feet high; herbage thinly hispid; blades of cauline leaves oblong to ovate or lanceolate, entire or dentate to pinnately lobed or parted, sagittate-clasping, 1 to 5 inches long, blades of the basal and lowest cauline similar, on short winged petioles; flower-buds congested, deep purple, showing as a terminal black-purple spot at the summit of the plant, the racemes therefore at first very dense, but soon becoming elongated and lax; flowers 6 to 7 lines long, spreading or pendulous, on pedicels 1 to 5½ lines long; pedicels and calyx more or less bristly; calyx at first deep purple, becoming greenish; petals white, dark veined, widely spreading; filaments of longest pair of stamens united about ⅔ or ¾ of their length, or sometimes all distinct; pods terete, stoutish, erect, reflexed or reflexed-spreading, glabrous, 2½ to 3 inches long.

Interior foothills and valley floors, 250 to 4000 feet: upper San Joaquin Valley and neighboring foothill ranges and foothill valleys, southward to the mountains on the west side of the Mohave Desert. Mar.-May.

Distribution note.—Streptanthus coulteri occurs chiefly in small colonies with well defined boundaries and to a less degree as scattered individuals. The known colonies are comparatively few in number. In 1932 a colony was found in Palo Prieto Pass, inner South Coast Range, on a westerly slope, the plants (in full flower) standing so thickly as to make a light-colored spot on the hill about 80 by 100 feet in area. All the individuals were plainly of one close descent as evidenced by the uniformity of habit, aspect, leaves, inflorescence and flowers. The flowering axes in the course of development of the fruit showed successively pendulous, spreading and finally erect pods. The half-grown pods are curiously vermiform-contorted.

Note on the flower.—The sepals are strongly keeled. The broad claws of the petals are contracted at apex and expand into the very undulate limbs. The limbs are really broader than the claw, but, being troughed and strongly undulate, do not appear so; they are white, or nearly so, with a few very dark or black pinnate veins. The short stamens are only half the length of the long stamens. The pedicels are hirsute with spreading hairs; there are also a few hairs of this kind advanced on the calyx keels. The pedicels and calyces of the congested flower-buds at the tip of the raceme are glabrous; these upper flowers with glabrous buds are sterile; the calyces of the older flowers are sparsely hirsute or bristly. Pubescence, however, varies in amount and may be absent from individual organs.

The embryos are very remarkable. Both cotyledons are deeply parted into three rounded lobes as shown in fig. 130. These remarkable structures afford further evidence of great weight that Streptanthus coulteri and S. californicus are closely allied. See also the discussion on the embryo in the taxonomic note under Streptanthus californicus.

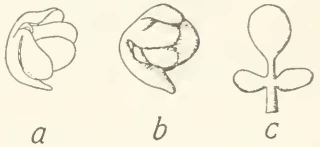

Fig. 130. STREPTANTHUS COULTERI Greene. *a*, *b*, embryos, × 6; *c*, cotyledon spread out, × 6.

Locs.— Sierra Nevada foothills from Madera Co. to Kern Co.: Pollasky, "Madera Co." (Ann. Mo. Bot. Gard. 9:297); Dunlap, Fresno Co., *Jepson* 2760; Orosi, Tulare Co., *Harriet Kelley;* Kaweah, *Hopping* 270; Havilah, Bear Creek, *Purpus* 1705; Caliente, *Davy* 1880. San Joaquin plain: Tulare, *Davy;* Oil City, Kern Co., *Heller* 7630 (pods erect). Inner South Coast Range: Palo Prieto Pass, e. San Luis Obispo Co., *Jepson* 16,201; White Hills, Cuyama, *Eastwood.* Mt. Pinos region: Bisses sta., Tehachapi Mts., *Dudley* 455 (pods spreading); San Emigdio, *Eastwood;* Leonis Valley *Davy* 2634; Saugus, *Davy.*

Var. **lemmonii** Jepson comb. n. Habit of the species; herbage glabrous or sparsely hirsute on lower part of stem; leaf-blades entire, coarsely toothed, or only weakly denticulate; raceme rather loose, the flowers deflexed or pendulous on pedicels 2 to 4 lines long; pedicels glabrous or the lower ones hairy; calyces glabrous or the lower ones hairy; pods erect, stout, 2 to 4 inches long; stigmas long, spreading conspicuously.—Dry rocky banks, 900 to 1200 feet: San Luis Obispo Co. Apr.

Locs.—Paso Robles, *Barber, Condit;* Cholame, *Lemmon.* This form has not been re-collected in the Cholame region. This fact in connection with consideration of the climatic differences between the Santa Lucia Mts. and the Inner South Coast Range suggests the surmise that Lemmon collected his plant near Paso Robles while on one of his trips from Paso Robles to Cholame. We think it likely, therefore, that var. lemmonii is a very narrow endemic restricted to the Paso Robles region.

The flowers are soon pendulous, likewise the very young fruits, which, however, become erect in maturity. In general only the lower flowers are fertile. In all of this there is close resemblance to S. coulteri. The distinguishing marks of S. lemmonii Wats. were supposed to be the glabrous herbage, the glabrous pedicels and calyces, the deeply cleft stigma and the erect pods. But erect pods may occur in S. coulteri and as to pubescence, the following forms show the range of variation in hairiness: (1) The extreme form, herbage, pedicels and calyx quite glabrous save that the stem is slightly hispid at base (Paso Robles, *Barber*). (2) Lower pedicels hairy, calyces glabrous, stems hirsute at base (Paso Robles, comm. *Georgiana P. Ballard*). (3) Lower pedicels densely bristly; calyces of lower flowers hairy; stem hirsute below (Paso Robles, comm. *Georgiana P. Ballard*). (4) All the pedicels hairy except the purple ones of the sterile cluster; calyces mostly glabrous (Paso Robles, *Carl & Dorothea Haueser*). (5) In a series of specimens collected by Betty Knight near Paso Robles, pubescent pedicels are associated with fertile flowers and glabrous pedicels with sterile flowers. This statement is more or less true of most material of this variety.

The upper pair of stamens are united by their filaments to the summit or they are free for nearly a line's length; in the lower pair the filaments are completely united or united for ¾ or ⅘ their length. There is in this matter of degree of union of the filaments obvious variation as in S. coulteri. While the stigmas are conspicuously long in all plants of this form, this character is one of degree only and will not serve in this case for specific distinction. The Paso Robles plants are, therefore, reduced to varietal rank. In aspect they are quite like S. coulteri.

Refs.—STREPTANTHUS COULTERI Greene, Fl. Fr. 257 (1891); Jepson, Man. 416, fig. 408 (1925). *Caulanthus coulteri* Wats. Bot. King 27 (1871), type from Cal., *Coulter.* Our present knowledge of the distribution of this species indicates that the Santa Clara Valley at or near Saugus is the only station crossed by the route of Thos. Coulter. Var. LEMMONII Jepson. *Streptanthus lemmonii* Jepson, Man. 416 (1925). *Caulanthus lemmonii* Wats. Proc. Am. Acad. 23:261 (1888), type loc. "Cholame," *Lemmon.* *S. parryi* Greene, Fl. Fr. 257 (1891), type a spm. collected by *Parry,* probably near Paso Robles.

11. **S. inflatus** Greene. Squaw Cabbage. Desert Candle. Annual; stem simple, very stout, becoming strongly hollow-inflated, 1 to 2½ feet high; herbage glabrous (rarely a little hispid at base); blades of cauline leaves erect, oblong-ovate to elliptic or oblong, obtuse or merely subacute, entire or denticulate, sessile-auriculate or -cordate, 1½ to 10 inches long; racemes at first very dense; pedicels glabrous or hispid, 2 to 4 lines long; flowers ascending, spreading or almost hori-

zontal; calyx at first deep purple, becoming white, glabrous or nearly so; petals white or purplish-tinged, little exserted; stamens exserted a little; pods 2 to 4¼ inches long, ascending or erect.

Dry plains and hills, 100 to 3500 feet: Mohave Desert, north over the upper San Joaquin Valley and through the Inner South Coast Range to western Fresno Co. Mar.-May.

Note on the flower.—The sepals are strongly keeled in such a way as to make the young buds markedly 4-sided. The petal limbs are very narrow and very undulate on both sides of the median band; they are only slightly exserted and spread rotately. The septum of the pod is often somewhat corky.

Field note.—In years of scanty rainfall in the desert the plants more often occur in the richer sandy spots on the mesas and thus form small colonies (3 to 8 feet in diameter) to the leeward of a bush of Larrea or similar shrub. Or yet again, especially in seasons of higher rainfall, they may dominate an area half a mile or a mile square, forming a very dense stand (the plants 6 inches to a foot apart) and distributed without reference to the woody growth. Even in luxuriant colonies the stems are as frequently simple as few-branched, so that the assemblage has a very distinctive aspect. In the Inner South Coast Range this species is also found in colonies of restricted area (⅛ to 2 or 3 acres), the colonies scattered at very wide intervals.

The tender and succulent leaves of the plant are gathered by desert miners and prospectors who cook them for "greens" and make a dish which is esteemed more delicate than spinach. In the Inner South Coast Range the herbage is similarly valued by settlers.

Locs.—Mohave Desert: Coolgardie Yucca Mesa, *Jepson* 6632, 6700; Stoddard's Well, *Jepson* 5904; Kramer, *Jepson* 15,448; Barstow, *Jepson* 5396; Randsburg, Kern Co., *Heller* 7702; Lancaster, *Davidson;* Rosamond, *Davy* 2272. Upper San Joaquin Valley: Bakersfield, *Eastwood;* Sunset, Kern Co., *Heller* 7724. Inner South Coast Range: Elkhorn Scarp, Temblor Range, *Jepson* 16,224; Zapato Chino Creek, sw. Fresno Co., *Jepson* 15,388; San Carlos Creek, w. Fresno Co., *Jepson* 2741.

Refs.—STREPTANTHUS INFLATUS Greene, Fl. Fr. 257 (1891); Jepson, Man. 416, fig. 407 (1925). *Caulanthus inflatus* Wats. Proc. Am. Acad. 17:364 (1882), type loc. Mohave Desert, *Lemmon, Parish Bros.*

12. **S. campestris** Wats. Stems one or few from the crown of a perennial root, mostly simple, 1½ to 4 feet high; blades of basal leaves oblong, irregularly dentate or denticulate towards the apex (the teeth setose-tipped), contracted at base to a winged petiole, the whole 5 to 7 inches long; upper leaves oblong to lanceolate, auriculate-clasping; flowers darkish purple, rarely yellowish, 4 to 5 lines long; sepals bristle-tipped; pods spreading and curved, 3 to 6 inches long, 1 line broad; style short, stout; stigma shortly 2-lobed; seeds winged.

Stony mountain slopes, 3000 to 7400 feet: San Bernardino Mts. to the Cuyamaca Mts. and south borders of San Diego Co. May-June.

Locs.—Bluff Lake, San Bernardino Mts., *Hall;* Santa Rosa Indian Village, Santa Rosa Mts., *Jepson* 1443; Campo, *Abrams* 3614.

Var. **bernardinus** Jtn. Blades of basal leaves thickish, spatulate-obovate, contracted to a short petiole, 1 to 1½ inches long, entire; flowers pale white, 3 lines long.—Mountain slopes or open forest, 5000 to 6500 feet: San Bernardino Mts. (Bear Valley, *Parish* 3035) and San Jacinto Mts. (Pine Cove, *C. V. Meyer* 147) to the Cuyamaca Mts. (*Abrams* 3874).

Var. **jacobaeus** Jepson comb. n. Pedicels 1 to 2 lines long; flowers whitish, sometimes purplish; sepals 2 to nearly 3 lines wide.—Laguna Mts., *Peirson* 4837; Julian to Banner, *Hall;* Cuyamaca Mts.

Refs.—STREPTANTHUS CAMPESTRIS Wats. Proc. Am. Acad. 25:125 (1890), type loc. Campo, *G. R. Vasey & S. B. Parish;* Gray, Syn. Fl. 1^1:169 (1895); Jepson, Man. 417 (1925). Var. BERNARDINUS Jtn. Pl. World 22:89 (1919). *Agianthus bernardinus* Greene, Lflts. 1:228 (1906), type loc. San Bernardino Mts., *Parish.* Var. JACOBAEUS Jepson. *Agianthus jacobaeus* Greene, l.c. 229, type loc. Cuyamaca Mts., *Orcutt* 1507.

13. **S. barbatus** Wats. Stems simple, few or several from a perennial root-crown, ascending or horizontally spreading, 1 to 2 feet high; leaf-blades cordate, sessile and clasping, obtuse, all similar and nearly equal, crowded, 5 to 9 lines long; flowers purple, 3 to 4 lines long; sepals obtusish, setosely bearded near the apex; pods spreading, curved, 1¼ to 2 inches long, 1 line wide; pedicels 1 line long; stigmas sessile or nearly so; seeds roundish, narrowly margined.

Sandy bottoms or rocky places, 3000 to 4000 feet: upper Sacramento River to Trinity Co. June.

Locs.—Sisson, *Congdon;* Hayfork Mt., *Tracy,* 6453.

Refs.—STREPTANTHUS BARBATUS Wats. Proc. Am. Acad. 25:125 (1890), type loc. upper Sacramento River, Wilkes Exped.; Gray, Syn. Fl. 1^1:169 (1895); Jepson, Man. 417 (1925). *S. tortuosus* Gray; Torr. Phanerogamia Pac. Coast N. Am. 227 (1874), not Kellogg (1863). *Cartiera barbata* Greene, Lflts. 1:226 (1906).

14. **S. cordatus** Nutt. Stems one or few from a perennial root-crown, often stout, 1 to 3 feet high; blades of basal leaves broadly spatulate-obovate, denticulate or dentate, especially toward the apex, and often setose-ciliate, ½ to 1½ inches long, on petioles ¼ to as long; blades of cauline leaves cordate-ovate to -oblong, mostly obtuse and entire, sessile, 1 to 2¼ inches long; flowers 6 lines long; sepals at first greenish, turning purplish, of one size, erect, bearing a tuft of 3 or 4 short bristles near the apex; petals purple, narrowly white-margined, 1⅓ to 1½ times as long as the sepals, with ovate claw contracted above to a ligulate limb; pods ascending or spreading, 2 to 3¼ inches long, 1½ to 2½ lines broad; pedicels short, 2 to 4 lines long; stigma subsessile; seeds orbicular, winged.

Dry sandy loam or rocky slopes of mountains and montane valleys, 5000 to 7500 feet: Alpine Co. to Shasta and Modoc Cos. East to Colorado, north to Oregon. June-July.

Tax. note.—E. L. Greene (Pitt. 3:227) argues that the "eastern California" plants long referred to Streptanthus cordatus do not represent Streptanthus cordatus Nutt., the original of which was collected by Nuttall in the northern Rocky Mts. In the absence of a type specimen he receives Wyoming and eastern Utah plants as true S. cordatus and points out that in these the sepals are not bristly at tip as in the plants of eastern California. However, in a sheet of Streptanthus cordatus, a Jones collection from Deep Creek, Utah, which is surely conspecific with our plants of northeastern California, the calyces of one individual show this feature of a bristle-tipped calyx, while in the other individual the sepals are glabrous.

The brief original description of Streptanthus cordatus Nutt. applies to our California plants save in that the flowers are described as greenish-white and the pods as deflexed. This statement as to color may for various reasons be unimportant, but the second point is more difficult. While the pods in our California plants are ascending or spreading, sometimes they are recurved as in the somewhat immature specimens of M. S. Baker from the Tamarack road, eastern Shasta County. It may be noted by way of comparison with other species that while the pods are typically reflexed in S. coulteri Greene, they are sometimes erect. Nuttall's original description covers explicitly the marked differences as to shape, petiolation and margin between the basal leaves and the cauline ones. We know of no other Streptanthus in which just this kind of heterophyllism occurs.

Geographic considerations, too, lend some weight to the view that the plants on the western edge of the Great Basin may be the same as Nuttall's original plant from the north-easterly side of the Great Basin. If the type specimens are not extant, as said, the doubts raised by Greene may never be resolved, though a careful survey of the Streptanthi along the path traversed by Nuttall in crossing the northern Rocky Mts. might furnish a solution. In this work we retain the well-known name for our plants as conspecific with the plants on the eastern side of the Great Basin commonly referred to this species.

Streptanthus cordatus in California occurs from Alpine Co. to Modoc Co. This form is well-known. S. cordatus is little known to us from "eastern California southward" (Pitt. 3:227) save in modified and very rare states which we specially indicate below as varieties. Citation of characteristic specimens of the species follows here.

Locs.—Ebbets Pass, *Brewer;* Red Clover Creek, Plumas Co.; summit Tamarack road between Clover Creek and Burney Valley, *M. S. Baker;* Davis Creek, Modoc Co., *Austin & Bruce* 2245; Ft. Bidwell, *Manning* 389; Mt. Bidwell, *Jepson* 7896; Pine Creek, Warner Range, *L. S. Smith* 965.

Two quite unlike high altitudinal California forms of this species occur southward as follows: Var. **exiguus** Jepson var. n. Dwarfish, 4 to 7 inches high; leaves ¾ to 1½ inches long, narrowly lanceolate, entire, acute or acutish, the cauline merely auriculate-sessile; flowers 4 to 5 lines long. —(Plantae reductae, unc. 4–7 altae; folia unc. ¾–1½ longa, anguste lanceolata, integra, acuta vel acutiuscula, caulina auriculato-sessilia; flores lin. 4–5 longi.)—Sonora Pass, 10,000 feet, *Brewer* 1885. Var. **duranii** Jepson var. n. Stems 14 inches high; leaves as in the species; raceme loose; flowers 4 to 5 lines long; sepals deep purple, a little loose or tending not to overlap by their edges (whereas in the species there is a regular or even overlapping of the sepals by their edges);

petals rather narrow, chocolate-color, white-tipped.—(Caules unc. 14 alti; racemi laxi; flores lin. 4–5 longi; sepala atropurpurea, vix imbricata.)—Cottonwood Creek, White Mts., 10,000 feet, *Victor Duran* 1647 (type).

Refs.—STREPTANTHUS CORDATUS Nutt.; T. & G. Fl. 1:77 (1838), type loc. forests of the Rocky Mts.; B. & W. Bot. Cal. 1:34 (1876); Jepson, Man. 417 (1925). *Euklisia cordata* Rydb. Bull. Torr. Club 33:142 (1906). *Cartiera cordata* Greene, Lflts. 1:226 (1906). *C. leptopetala* Greene, l.c., type loc. Stein's Mt., e. Ore., *Cusick* 2002. *S. crassifolius* Greene, Pitt. 3:227 (1897), "eastern Cal. southward, and in adjacent Nev. and Ariz." Var. EXIGUUS Jepson. Var. DURANII Jepson.

15. **S. tortuosus** Kell. Shield Plant. Annual; stem branching from the base, erect, often bush-like, sometimes nearly simple, 1 to 5½ feet high, sometimes reduced and 3 to 6 inches high; herbage glabrous and glaucous; blades of lower leaves obovate to spatulate-obovate, ½ to 1 inch long, contracted at base to a petiole as long; blades of upper leaves becoming oblong- to ovate- or orbicular-cordate, entire, sessile and clasping, ½ to 1¾ inches long, mostly ¼ to 1¾ inches broad; sepals purplish, connivent; petals rose-purple or white and purple-veined, 2½ to 6 lines long; pods recurved-spreading, 1½ to 4¾ inches long, ½ to 1 line wide; stigma small, sessile; seeds orbicular, narrowly winged.

Montane, 2000 to 7000 feet: Sierra Nevada from Tulare Co. to Tehama Co.; outer and middle Coast Ranges from Siskiyou Co. to Monterey Co. June-Aug.

Note on the flower.—The flowers are somewhat bilabiate, a little by reason of structure, a little by reason of position of parts; that is to say, the upper pair of petals elongate sooner than the lower and are always somewhat longer. Similarly the upper pair of the 4 longer stamens are longer than the pair on the lower side of the flower. The two short stamens have each a lateral position and barely show at the mouth of the corolla; their acute or mucronate anthers, however, have upturned points and thus belong on the upper side of the flower.

Locs.—Sierra Nevada: Farewell Gap, *Jepson* 998; Marble Fork, Kaweah River, *Jepson* 651; Round Mdw., Giant Forest, *Jepson* 715; Big Creek sta., Fresno Co., *Jepson* 13,114, 13,117; Mono Pass, *Brewer* 1727; Little Yosemite, *Jepson* 3158; Coulterville grade to Yosemite, *Jepson* 13,407; Hog Ranch, Hetch-Hetchy, *A. L. Grant* 966; Italian Bar, Tuolumne Co., *Jepson* 6382; Fischer's Cabin, Mokelumne River, *Hansen;* Heather Lake, Eldorado Co., *Jepson* 8162; Donner Lake, *Heller* 7016; Quincy, *Heller* 10,854; Broke-off Mt., *J. Grinnell.* Coast Ranges: Upton near Sisson, *Jepson* 13,406; Shackelford Cañon, w. Siskiyou Co., *Jepson* 2818; Humboldt Co., *Chesnut & Drew;* Duncan Mills, Sonoma Co., *M. S. Baker;* Mt. Diablo, *F. P. McLean;* San Antonio trail, Santa Lucia Mts., *Jepson* 1663.

Var. **orbiculatus** Hall. Annual; stems many from the base (or more commonly from a short erect axis 1 or 2 inches long), 3 to 6 or 9 inches high; flowers smaller (2½ to 4 lines long), darker purple.—High montane, 7000 to 10,500 feet: Sierra Nevada; high North Coast Ranges from Humboldt Co. to Siskiyou Co. Within its high altitudinal range, this form is fairly constant but has no character which separates it decisively from the prevailing form of the species at lower altitudes. Moreover, numerous intermediates occur, doubtless equaling in number of individuals either the species or its variety.

Locs.—Sierra Nevada: Silver Lake, Alpine Co., *Jepson* 10,105; Big Mdw., Alpine Co., *Jepson* 10,140; Harden Lake, Tuolumne Co., *A. L. Grant* 1278; Vogelsang Pass, *Jepson* 3230; Mt. Lyell, *Jepson* 3333; Lake Merced, Yosemite, *Jepson* 3180; Kaiser Crest, *A. L. Grant* 1016; Daulton Mdw., Fresno Co., *Jepson* 13,005; Mt. Silliman, *Jepson* 752; Farewell Gap, *Jepson* 1138, 1151. Coast Ranges: Trinity Summit, *Jepson* 2118; Mt. Shasta, *Jepson* 13,405.

Var. **flavescens** Jepson. Annual; flowers yellow.—Sawtooth Range.

Var. **oblongus** Jepson. Annual; stem tall (2 to 3 feet high), openly branched; leaves of the main stem long-oblong, 1⅓ to 3¾ inches long.—W. Siskiyou Co. (Cottage Grove, *Jepson* 2862) to n. Trinity Co. (Burnt Ranch, *Tracy* 6099).

Var. **pallidus** Jepson var. n. Annual; coarse and somewhat succulent, 3 feet high; leaves very blue-glaucous beneath; sepals pale yellow; petals pale or whitish, purple-veined.—(Crassus, succulentiusculus, ped. 3 altus; folia infra caeruleo-glaucissima; sepala flavescentia; petala pallida albidave, purpureo-venata.)—Rocky bluffs, Trinity Co., 1500 feet (Junction City, *J. P. Tracy* 7534, type).

Var. **suffrutescens** Jepson. Coarse biennial 1 to 2 feet high, the stems half-woody at base; cauline leaves (of the main stems) obovate or oblong, cordate- or hastate-clasping, only the lower petioled, these with the blades obovate, somewhat saliently serrate, ¾ to 1¼ inches long, on petioles 3 to 5 lines long.—Hoods Peak Range.

Var. **optatus** Jepson var. n. Biennial or triennial, 1¼ to 2¼ feet high; branches erect, simple, few or several from the basal woody main stem; leaves dimorphic, those of the first, second and third year sterile shoots obovate to oblong, serrate or subentire, 1 to 2½ inches long, drawn down to petioles 4 to 9 lines long; leaves of the flowering shoots, at least the upper ones, cordate-clasping as in the species; racemes tending to be secund.—(Herbae biennes vel triennes, rami simplices, erecti, e cauli primo basilari lignosi; folia pulli sterili, [anni primi, secundi et tertii] obovata vel oblonga, serrata vel subintegerrima, unc. 1–2½ longa; racemi esse secundi inclinati.)—Openly wooded slopes in the mountains or foothills, 1100 to 5700 feet: Fresno Big Trees, Madera Co. (*Jepson* 15,998, type, the flowering stems mostly in threes, noticeably diverging yet in the main erect); Gwin Mine, Calaveras Co., *Jepson* 1807.

Refs.—STREPTANTHUS TORTUOSUS Kell. Proc. Cal. Acad. 2:152, fig. 46 (1863), type loc., "the Copper region of the Sierra Nevada, *C. D. Gibbs*" (probably in western Calaveras Co. or Amador Co.). *Pleiocardia tortuosa* Greene, Lflts. 1:86 (1904). Var. ORBICULATUS Hall, Univ. Cal. Publ. Bot. 4:197 (1912); Jepson, Man. 418, fig. 409 (1925). *S. orbiculatus* Greene, Fl. Fr. 258 (1891), type loc. n. of Donner Lake; Jepson, Fl. W. Mid. Cal. 214 (1901), ed. 2, 182 (1911). *Pleiocardia orbiculata* Greene, Lflts, l.c. Var. FLAVESCENS Jepson, Man. 418 (1925), type loc. Coyote Pass trail, Sawtooth Range, *Jepson* 982. Var. OBLONGUS Jepson, Man. 418 (1925), type loc. Burnt Ranch, Trinity Co., *Tracy* 6099. Var. PALLIDUS Jepson. Var. SUFFRUTESCENS Jepson, Man. 418 (1925) in part. *S. suffrutescens* Greene, Erythea 1:147 (1893), type loc. Hoods Peak, Sonoma Co., *Bioletti*; Jepson, Fl. W. Mid. Cal. 213 (1901), ed. 2, 181 (1911). *Pleiocardia suffrutescens* Greene, Lflts., l.c. Var. OPTATUS Jepson.

16. **S. gracilis** Eastw. Annual; stem simple or with delicate branches from near the base, 2 to 7 inches high; herbage glabrous; blades of lower leaves orbicular to spatulate, sinuate-dentate to pinnately lobed, 2 to 6 lines long, on petioles 1 to 3 times as long; upper cauline leaves mostly sessile, oblong to ovate, toothed or entire, auriculate-clasping, 2½ to 6 lines long; raceme 1 to 3 inches long, bearing below 1 or 2 small ovate sessile bracts (1½ to 2 lines long); flowers 3½ to 4 lines long; sepals rose-purple, the tips membranously margined, spreading; petals lavender-purple to pink, with slender claw exserted, the limb broad, purple-veined; upper pair of filaments longest; pods erect, slender, 1½ to 2 inches long.

Disintegrated granite, 10,000 feet: region of the Kings-Kern divide, Sierra Nevada. July.

Locs.—Bullfrog Lake, Fresno Co., *Jepson* 835; head of Kern Cañon, *Jepson* 5032.

Refs.—STREPTANTHUS GRACILIS Eastw. Proc. Cal. Acad. ser. 3, 2:285 (1902), type loc. trail from East Lake to Harrison Pass, Tulare Co., *Eastwood*; Jepson, Man. 418 (1925). *Pleiocardia gracilis* Greene, Lflts. 1:86 (1904).

17. **S. diversifolius** Wats. Annual; stem erect and slender, branching above, 10 to 22 inches high; cauline leaves very narrowly linear, pinnately divided into a few remote narrowly linear or filiform segments, or sometimes linear and entire; bracts of the inflorescence broadly cordate, commonly long-caudate at apex; sepals pale with short recurved tips; petals at first pale lemon-yellow, becoming whitish and yellow-veined, 3 to 4 lines long, the limb orbicular; filaments in pairs, the upper longest, all distinct; anthers long, sagittate; pods straightish or a little curved, reflexed, about 3 inches long, ⅔ line broad, style short; pedicels ½ to 2 lines long; seeds broadly elliptical, narrowly winged.

Rocky places in the foothills, 1000 to 4700 feet: Sierra Nevada foothills from Amador Co. to Tulare Co. Apr.-June.

Tax. note.—In the upper leaves the broad base tapers upward suddenly to a linear prolongation which is tipped with a small blunt enlargement. The lower leaves have a similar enlargement at the tip of the divisions. A similar structure is often found on the leaves of Streptanthus polygaloides and S. breweri, but not, apparently, on those of S. tortuosus. The flowers in position of parts are sometimes a little "bilabiate", as in S. tortuosus.

Locs.—Hog Ranch, Hetch-Hetchy, *A. L. Grant* 966; Mormon Bar, *Congdon*; Dunlap to Millwood, Fresno Co., *Jepson* 2765; Kaweah, *Hopping* 284; Bear Creek, Tulare Co., *Purpus* 1743.

Refs.—STREPTANTHUS DIVERSIFOLIUS Wats. Proc. Am. Acad. 17:363 (1882), type loc. "Cosumne Creek" (= Cosumnes River), *Rattan* 223; Gray, Syn. Fl. 1^1:168 (1895); Jepson, Man. 419 (1925). *Mitophyllum diversifolium* Greene, Lflts. 1:88 (1904). *S. linearis* Greene, Pitt.

3:225 (1897), type loc. Mariposa Co., *Congdon*. *S. foliosus* Greene, l.c. 226, type loc. "mts. of Fresno Co."; the "fragments" were probably collected near Peckinpah Mill (now Madera Co.) by *Mrs. L. A. K. Peckinpah*. *Pleiocardia fenestrata* Greene, Lflts. 1:86 (1904), type loc. Tehipite Valley, *Hall & Chandler* 492; the specimens represent plants of apparently stunted growth.

18. **S. heterophyllus** Nutt. Annual; stem usually simple, 1¼ to 5 feet high; herbage hirsute on the lower half of the plant or only on the basal parts; leaves 1½ to 3½ inches long, the blades oblong or linear to lanceolate, dentate with triangular or subulate teeth, or pinnately and shallowly lobed, the lobes linear to oblong, usually remote and often salient; uppermost leaves sometimes entire, all sagittate-clasping except the basal; flowers 2½ to 3½ lines long; calyx greenish to dark-purple; petals linear, white, dark purple-veined; pedicels 2 to 4 lines long; pods and pedicels abruptly reflexed, the pods straight, 2 to 3¼ inches long, somewhat 4-angled; style ½ line long; seeds narrowly winged.

Foothills and cañons, 200 to 3500 feet: coastal Southern California from Santa Barbara Co. to San Diego Co. Mar.-Apr.

Locs.—Big Tujunga Cañon, *Peirson* 63a; Rubio Cañon foothills, *Peirson* 63; San Bernardino, *Parish;* Escondido, *C. V. Meyer* 7; Ramona, *Jepson* 8519; San Diego, *T. Brandegee*.

Refs.—STREPTANTHUS HETEROPHYLLUS Nutt.; T. & G. Fl. 1:77 (1838), type loc. San Diego, *Nuttall;* Jepson, Man. 417 (1925). *Caulanthus heterophyllus* Payson, Ann. Mo. Bot. Gard. 9:298 (1922).

19. **S. polygaloides** Gray. Annual; stem slender, simple or branched, 1 to 3 feet high; leaves filiform, entire, some sagittate-clasping; flowers very shortly pediceled, yellowish or purple, 3 lines long; calyx very broad; lower sepal suborbicular, abruptly acute; upper sepal suborbicular, retuse, mucronate, larger than the lower sepal, very broad, resembling the banner in a papilionaceous flower; lateral sepals lanceolate or elliptic, acute or acuminate; petals with expanded claw and narrowed limb, the lower 3 spreading, the upper one erect; stamens in 3 unequal pairs; upper pair of filaments connate to the summit, exserted, bearing small but polliniferous anthers; pods 1 to 1½ inches long, ½ line wide, at length reflexed; seeds oblong.

Open slopes, dry soil, 900 to 3000 feet: Sierra Nevada foothills, from Sierra Co. to Mariposa Co. May-June.

Locs.—Downieville, Sierra Co., *Adeline Frederick;* Alleghany, Nevada Co., *L. S. Smith;* Harmon Peak, Calaveras Co. (fls. yellow), *Davy* 1434; Priest Hill, Tuolumne Co., *Blasdale;* Bagby, Mariposa Co.; Mt. Bullion, *Bolander* 4848.

Refs.—STREPTANTHUS POLYGALOIDES Gray, Proc. Am. Acad. 6:519 (1865), type loc. along the Tuolumne River, *Brewer;* Jepson, Man. 419 (1925). *Microsemia polygaloides* Greene, Lflts. 1:89 (1904).

20. **S. breweri** Gray. Annual; stem widely branching from near the base, ⅔ to 2 feet high; herbage glabrous, also glaucous, especially on the lower side of the leaves; leaf-blades broadly ovate and acute to narrowly lanceolate, denticulate or entire, sessile, 1 to 2½ inches long, the blades of the lowest leaves broadly spatulate to cordate-orbicular, with a short winged petiole; flowers 3 to 5 lines long, erect, short-pediceled; sepals acuminate, the tips slightly spreading; upper petals white or delicately veined with purple, the lower dark purple-veined or dark purple tipped with white; upper pair of filaments connate to apex, very dark purple, conspicuous; pods ascending, slightly to markedly curved, obscurely torulose, 1½ to 2½ inches long, ½ line wide; stigma sessile or nearly so; seeds small, orbicular, not winged.

Dry brushy slopes, 1500 to 4000 feet: inner Coast Range from Glenn Co. to San Benito Co. June-July.

Locs.—Between Mud Flat and Bennett Spr., Glenn Co., *Heller* 11,549; Snow Mt., Lake Co., *T. Brandegee;* Mt. Hepsedam (Syn. Fl. 1^1:472).

Var. **hesperidis** Jepson comb. n. Stem with few mostly simple branches; racemes secund or mostly so; sepals greenish; petals little exserted; upper pair of petals whitish, the limb acute or narrow at apex, the lower pair with broader or rounded limb, whitish and purplish-veined.—Dry rocky slopes, 1500 to 2500 feet, Putah Creek basin: Knoxville grade, *Jepson* 13,355; Butts Cañon, Napa Co.; Mt. St. Helena, *Tracy* 2238; Moore's Creek, Howell Mt., *Tracy* 2219. This variety is disposed to lose its basal leaves early.

Refs.—STREPTANTHUS BREWERI Gray, Proc. Am. Acad. 6:184 (1864), based on spms. from Arroyo del Puerto, near Mt. Oso, sw. Stanislaus Co., *Brewer* 1268, and Mt. San Carlos, San Benito Co., *Brewer* 790; Jepson, Fl. W. Mid. Cal. 214 (1901), ed. 2, 182 (1911), Man. 419, fig. 411 (1925). *Pleiocardia breweri* Greene, Lflts. 1:86 (1904). Var. HESPERIDIS Jepson. *S. hesperidis* Jepson, Erythea 1:14 (1893), type loc. Knoxville grade to Lower Lake, Lake Co., *Jepson* 13,355. *Pleiocardia hesperidis* Greene, Lflts. 1:86 (1904).

21. **S. barbiger** Greene. Annual; stem with erect branches from above the base, 1 to 2¼ feet high; leaves 1 to 6 inches long, the blades linear to elongated linear-lanceolate, entire or the lower dentate, auriculate at base or not at all auriculate, sessile or drawn down to a short petiole; racemes mostly a little loose; flowers 3 lines long, disposed to be secund, often markedly so; sepals greenish with whitish or membranous recurved tips; limb of petals rounded, not crisped or scarcely; upper pair of petals white, lower pair white with a purple band from claw running nearly to center of limb; upper pair of filaments united to top, the lower pair united half way; pods reflexed or reflexed-spreading, slightly curved, rather obscurely torulose, but little known; seeds not winged.

Openly brushy slopes, 500 to 1500 feet: Lake Co. to Napa Co. June-July.

Tax. note.—Greene (Fl. Fr. 260) describes the calyx as "bristly-hairy", an apparently unusual character for S. barbiger as we now know it. The calyces sometimes exhibit parallel hairlike lines in relief which imitate appressed bristles. However, this entire breweri-barbiger-niger series is unusually productive of variables, even for Streptanthi.

Locs.—Snow Mt., *T. Brandegee;* Lakeport, *C. F. Baker* 3059; Mt. Hanna, *Jepson* 13,354; St. Helena (Fl. Fr. 260).

Refs.—STREPTANTHUS BARBIGER Greene, Pitt. 1:217 (1888), type loc. Highland Sprs., Lake Co., *A. B. Simonds;* Jepson, Fl. W. Mid. Cal. 214 (1901), ed. 2, 182 (1911). *Mesoreanthus barbiger* Greene, Lflts. 1:89 (1904). *M. fallax* Greene, l.c. 90, type loc. St. Helena, *Greene. M. vimineus* Greene, l.c. 90, type loc. Lakeport, *C. F. Baker* 3059.

22. **S. niger** Greene. Annual; stem stout, 1½ to 3 feet high, branched above an erect main axis 2 to 12 inches long; leaves linear, the blades of the lower ones pinnately but shallowly lobed or toothed, the blades of the upper entire and auriculate-clasping; racemes loose, flexuous, the pedicels 3 to 9 lines long; sepals dark purple or black; petals very narrow, white with dark purple mid-vein; pods straight or only slightly curved, ascending, 1 to 2 inches long, 1 line broad; seeds narrowly winged.

Hillslopes, 50 to 400 feet: Tiburon, Marin Co. Apr.–May. Closely allied to S. glandulosus.

Tax. note.—The fluctuating Streptanthus glandulosus furnishes certain variants which approach S. niger but none of them has all the characters of S. niger, which seems to be an extreme derivation. The stems and leaves of S. niger are quite glabrous, a condition not found in specimens of S. glandulosus. The pedicels in the latter species are usually shorter than the flowers, in the former they are nearly twice as long. S. niger is known only from Tiburon. A similarly restricted endemic is Castilleia neglecta Zeile, while Convolvulus superatus Jepson var. purpuratus (Greene) Jepson and Monardella neglecta Greene are nearly confined to the Tiburon peninsula.

Refs.—STREPTANTHUS NIGER Greene, Bull. Torr. Club 13:141 (1886), type loc. Tiburon, Marin Co., *Greene,* Man. Reg. S. F. Bay 16 (1894); Jepson, Fl. W. Mid. Cal. 214 (1901), ed. 2, 182 (1911), Man. 419 (1925). *Euclisia nigra* Greene, Lflts. 1:83 (1904). *E. violacea* Greene, l.c., type loc. mid. Cal., *Palmer,* probably belongs here, though we have seen no authentic spms.

23. **S. glandulosus** Hook. Jewel Flower. Annual; stem nearly simple or with ascending branches from an erect axis, 1 to 2 feet high; herbage more or less hispid; blades of the lower leaves oblanceolate, coarsely and often saliently toothed, at least the basal slender-petioled, the blades of upper leaves lanceolate to linear,

toothed or entire, sessile and auriculate-clasping, the teeth callous-tipped; flowers 5 to 6 lines long; calyx commonly deep purple, 3 upper sepals approximate or connivent at tips, the lower free from the others and usually spreading; petals purple, or white with conspicuous purple veins, the upper pair commonly longer and darker; claws broad, the limbs curved-spreading; longest pair of filaments often connate for their entire length and with reduced anthers; pods curved, more or less spreading, glabrous or hispid, 2 to 3 inches long, 1 line wide; pedicels 4 to 4½ lines long; seeds elliptical, narrowly winged.

Middle altitudes, 1000 to 2000 feet: Coast Ranges from Mendocino and Solano Cos. to San Luis Obispo Co. Apr.-June.

Note on variation.—Streptanthus glandulosus is a polymorphic species. Its leaves vary from hispid to nearly glabrous; they are of varying shapes and degrees of dentation but are narrow and, except the lowermost, more or less auriculate at base. The calyx varies in color from pale purple to nearly black and in shape from slender (not saccate) to conspicuously saccate and almost inflated. The petals are almost equally variable in color, size and shape. The pods in position are erect, spreading, or descending.

Locs.—Mt. Sanhedrin, *Jepson* 13,409; Ukiah, *Jepson* 2508a; South Mill Creek, Mayacamas Range, *Jepson* 3013, 9223; Geysers, Sonoma Co., *Bolander* 3944; Walker Cañon, Vaca Mts., *Jepson*, 13,410; Napa Range e. of Calistoga, *Jepson* 13,412; Conn Valley, Napa Co., *Jepson* 13,411; Oakland Hills, *Bioletti;* Las Trampas Ridge, Contra Costa Co., *Jepson* 13,408; Mt. Hamilton, *Pendleton* 903; Alma Soda Spr., Santa Clara Co., *Heller* 7502; Eva sta., Santa Cruz Mts., *Jepson* 13,414; sw. Stanislaus Co., *Brewer* 1269; Big Sur River, Monterey Co., *Davy* 7448; San Luis Obispo, *Brewer* 458.

Var. **albidus** Jepson. Stem very stout and erect, 2 feet high; herbage glabrous and glaucous above, some scattered pubescence only on lower part of stem and lower leaves; leaves like S. glandulosus; raceme strictly bilateral; flowers large (6 lines long); sepals white-margined and -tipped, purplish below; petals with limb conspicuous, crisped, white with purplish veinlets; pods erect, stout, 3 inches long.—Hillsides south of San Jose. Apparently this has been collected only by Rattan (in 1886 and 1887). It has some claims to specific rank but is so little known that we leave it in varietal status until more ample material is available. Volney Rattan writes: "I found the Streptanthus west of the Oak Hill (Catholic) Cemetery, four miles south of San Jose. It grows on the nw. slope above the [Cincas] creek which closely hugs the base of the hills on the west" (Jepson, Botanical Letters of Other Days, p. 232. ms.).

Var. **pulchellus** Jepson. Stem generally branching, 4 to 12 inches high; herbage pubescent throughout; leaf-blades oblong-linear to oblong-lanceolate, with opposite salient teeth; raceme often subsecund; pedicels hairy, 1 to 2 lines long; sepals commonly very slightly hispid; pods commonly a little hispid, at least the lower ones.—Dry ridges, Marin Co.

Refs.—STREPTANTHUS GLANDULOSUS Hook. Ic. Pl. t. 40 (1836), type from Cal., *Douglas;* B. & W. Bot. Cal. 1:34 (1876); Jepson, Fl. W. Mid. Cal. 214 (1901), ed. 2, 182 (1911), Man. 419 (1925). *Euclisia glandulosa* Greene, Lflts. 1:82 (1904). *S. peramoenus* Greene, Bull. Torr. Club 13:142 (1886), type loc. Oakland Hills, *Bolander, Greene. S. versicolor* Greene, Erythea 3:99 (1895), type loc. Navarro River, Mendocino Co., *Edith Byxbee. Euclisia versicolor* Greene, Lflts. 1:83 (1904). *S. mildredae* Greene, Fl. Fr. 260 (1891), type loc. Mt. Hamilton, *Mildred Holden. Euclisia mildredae* Greene, Lflts. 1:83 (1904). *S. biolettii* Greene, Pitt. 2:225 (1892), type loc. Hoods Peak, Sonoma Co., *Bioletti;* Man. Reg. S. F. Bay 17 (1894). *Euclisia biolettii* Greene, Lflts. 1:83 (1904). *E. elatior* Greene, Lflts. 1:84 (1904), type loc. Santa Lucia Mts., *G. R. Vasey. E. bakeri* Greene, Lflts. 1:84 (1904), type loc. Bethany, San Joaquin Co., *C. F. Baker* 2785. *S. asper* Greene, Pitt. 3:225 (1897), type loc. Mt. St. Helena, *Greene. Euclisia aspera* Greene, Lflts. 1:83 (1904). Var. ALBIDUS Jepson, Man. 419 (1925). *S. albidus* Greene, Pitt. 1:62 (1887), type loc. s. of San Jose, *Rattan. Euclisia albida* Greene, Lflts. 1:83 (1904). Var. PULCHELLUS Jepson, Man. 420 (1925). *S. pulchellus* Greene, Pitt. 2:225 (1892), type loc. Mt. Tamalpais, *M. A. Howe. Euclisia pulchella* Greene, Lflts. 1:83 (1904).

24. **S. secundus** Greene. Annual; stem 10 to 16 inches high; herbage similar to no. 23; racemes rather dense, secund; calyx as if 2-lipped, the 2 upper sepals approximate and larger than the 2 lower approximate ones; petals white; pods recurved or pendulous; seeds wingless.

Shale slides, lower mountain slopes, 400 to 1600 feet: Marin Co. to Sonoma Co. May-June.

Locs.—Lake Lagunitas, Mt. Tamalpais, *Jepson* 2480; Mark West Creek, Sonoma Co., *Jepson* 2430.

Refs.—STREPTANTHUS SECUNDUS Greene, Fl. Fr. 261 (1891), type loc. n. base Mt. Tamalpais; Man. Reg. S. F. Bay 17 (1894); Jepson, Fl. W. Mid. Cal. 215 (1901), ed. 2, 182 (1911); Man. 420, fig. 412 (1925), excl. Lake Co. plants. *Euclisia secunda* Greene, Lflts., 1:83 (1904).

25. **S. hispidus** Gray. Annual; dwarfish, hispid throughout, branching, 2 to 6 inches high; leaf-blades obovate, coarsely toothed, not auriculate, all sessile except the very lowest, ½ to 1½ inches long, the basal crowded; raceme sub-secund; sepals hispid with brownish hairs; petals purplish with white margins, 3 to 4 lines long; pods erect or ascending, very hispid, 1½ to 3 inches long, 1 line wide, the pedicels ½ to 1 line long; style short and stigma broad; seeds elliptical, winged.

Summits of the inner South Coast Range peaks, 3500 to 4800 feet: Mt. Diablo; San Carlos Range. Mar.-May.

Locs.—Mt. Diablo, *Bolander* 6267, *Congdon*, *Lemmon*, *Jepson* 2641, *E. W. Hicks* 112; San Carlos Range, w. Fresno Co. (Syn. Fl. 1:472).

Refs.—STREPTANTHUS HISPIDUS Gray, Proc. Am. Acad. 6:186 (1864), type loc. Mt. Diablo, *Brewer*; Jepson, Fl. W. Mid. Cal. 215 (1901), ed. 2, 183 (1911), Man. 420 (1925). *Euclisia hispida* Greene, Lflts. 1:83 (1904).

3. THELYPODIUM Endl.

Ours mostly coarse erect annuals or biennials, rarely perennial. Basal leaves mostly petioled, the cauline petioled or sessile-auriculate. Flowers white or pale yellow, rarely purple or roseate, the racemes often dense. Petals with narrow claw, the exserted limb narrow or obovate, plane or crisped. Stamens tetradynamous, exserted; filaments distinct, in a few species often united; anthers narrowly linear, curved. Stigma small, circular and entire or obscurely 2-lobed. Pod terete, slender, short-stipitate or sessile. Seeds oblong, somewhat flattened, not winged or scarcely so. Cotyledons incumbent.—Species about 15, North America. (Greek thelus, female, and pus, foot or support, the ovary more or less stipitate.)

Cauline leaves not sagittate- nor auriculate-clasping; annuals or biennials.
  Flowers spreading in a dense spike-like raceme; fruiting racemes dense; herbage glabrous; transmontane biennials.
    Blades of cauline leaves sessile, entire; racemes short, compact............1. *T. integrifolium.*
    Blades of cauline leaves petioled, irregularly laciniate or entire, the upper subentire; racemes much elongated............2. *T. laciniatum.*
  Flowers in a raceme, the raceme soon lax; fruiting racemes commonly lax; annuals.
    Flowers ascending; mostly Coast Ranges and coastal S. Cal.
      Blades of cauline leaves, at least the uppermost, sessile; flowers 4 to 5 lines long; pods ascending; herbage glabrous or nearly so............3. *T. flavescens.*
      Blades of cauline leaves petioled or mostly petioled; flowers 1½ to 2½ lines long.
        Calyx purple or purplish; pods ascending or deflexed; herbage glabrous or nearly so............4. *T. lemmonii.*
        Calyx green or yellowish; pods commonly reflexed or divaricate-spreading; herbage hispid in part............5. *T. lasiophyllum.*
    Flowers soon reflexed; pods with a beak 1 to 3 lines long; leaves all petioled; herbage glabrous and glaucous; southern deserts............6. *T. longirostris.*

Cauline leaves sagittate- or auriculate-clasping; herbage glabrous and glaucous.
  Pods not torulose or scarcely so, ascending; annuals or no. 8 biennial; plants usually tall.
    Raceme very dense and spike-like; n. and e. of Sierra Nevada..........7. *T. brachycarpum.*
    Raceme not dense or spike-like; leaves all entire.
      Petals spatulate, 2 times as long as the sepals; buds ovate; n. Cal.......8. *T. howellii.*
      Petals linear-oblanceolate, 1¼ to 1½ times as long as the sepals; buds linear; San Bernardino Mts............9. *T. stenopetalum.*
  Pods more or less markedly torulose.
    Perennial with heavy root-crown; pods ascending; plants low, the stem with few reduced leaves; Modoc Co............10. *T. flexuosum.*
    Annual; pods declined-spreading; stem with elongated-serpentine branches; deserts......11. *T. cooperi.*

1. **T. integrifolium** Endl. Stem simple or branched only above, 3 to 6 feet high; herbage glabrous; blades of basal leaves ovate-lanceolate, entire or shallowly repand-dentate, 1 to 6 inches long, drawn down into petioles nearly as long; blades of upper leaves linear-lanceolate, sessile (the lower ones sometimes auriculate), acute, erect; flowers crowded in subcapitate racemes; racemes 1 to 2 (or 4) inches long, several in a terminal slightly leafy-bracteate panicle; pedicels 1 to 3 lines long; racemes little elongated in fruit, the pods therefore crowded and forming a sort of "brush"; pods widely spreading, slender, torulose, curved upwards, 1 to 1⅛ inches long; stipe ¼ to ½ line long.

Moist situations or in stream bottoms, 2300 to 8000 feet: Mohave Desert; White Mts. East to Colorado, north to eastern Washington. June-Aug.

Note on the glands.—In Thelypodium integrifolium, as it occurs in Oregon and Washington (the type region), the flowers have four distinct nectar glands. In Mohave Desert plants (representing the form called T. affine Greene) the flowers have the 4 glands united in such various degrees that they may occur as two only and entire, or two and variously notched as shown in fig. 131. See further, under "Locs." below, *Parish* 1485. This condition of more or less partial union of the glands is to be seen also in plants at Wadsworth, Nev. (*Palmer* 22). Thelypodium affine Greene, considered as distinct from T. integrifolium, rests essentially upon the gland character, but we regard this character as variable and uncertain. In aspect and in detail of structure the Californian plants seem essentially like those of the north, that is, those of Oregon and Washington.

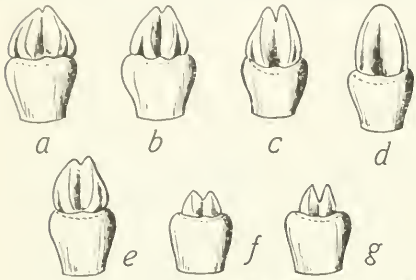

Fig. 131. THELYPODIUM INTEGRIFOLIUM Endl. Variation in the lobation of the flower glands: *a*, *b*, *e*, Victorville, *Parish* 10,532; *d*, *e*, Victorville, *Johnston* 1772; *f*, *g*, Wadsworth, Nev., *Palmer* 22.

Locs.—So far as now known to us, this species occurs in California only in the White Mts. (Roberts Ranch, Wyman Creek, *V. Duran* 1688) and in a crescent-shaped area on the westerly margin of the Mohave Desert along the base of the mountains or on their lower slopes as follows: Tehachapi Mts.; Lancaster, *Parish* ms; Rancho Verde, Victorville, *Parish* 10,532; Rabbit Sprs., *S. B. & W. F. Parish* 1485 (glands mostly 2 and entire, in some cases notched, in at least one flower 4 distinct glands); Cushenbury Sprs., *Parish* ms. Palmer (Contrib. U. S. Nat. Herb. 1:7) also found it at Victorville and says the leaves were gathered by the Indians and eaten after being cooked.

Refs.—THELYPODIUM INTEGRIFOLIUM Endl.; Walp. Rep. 1:172 (1842); Jepson, Man. 412 (1925). *Pachypodium integrifolium* Nutt.; T. & G. Fl. 1:96 (1838), type loc. Rocky Mt. plateau towards the Columbia River as far as Walla Walla, *Nuttall;* H. & A. Bot. Beech. 321, t. 74 (1840). *Pleurophragma integrifolium* Rydb. Bull. Torr. Club 34:433 (1907). *T. affine* Greene, Pitt. 4:314 (1901), type loc. Tehachapi, *Greene.*

2. **T. laciniatum** Endl. Stem stout, freely branching, 1¾ to 2½ feet high; herbage glabrous; leaf-blades deltoid-ovate to oblong or oblong-lanceolate, irregularly segmented and toothed, a little fleshy, 1¼ to 8 inches long, the petioles ½ to as long; racemes very dense, ½ to 1½ feet long; flowers 4 to 5 lines long; petals white, linear or oblong, much exserted; stamens exserted; pods very slender, spreading or horizontally divaricate, 1¼ to 6 inches long; pedicels 1 to 2 lines long.

Valleys and foothills, 2000 to 4000 feet: Inyo Co.; Siskiyou Co. North to western Nevada and eastern Oregon and Washington. May-June.

Tax. and geog. note.—The very long and dense fruiting racemes of slender elongated pods is a feature of this striking but somewhat polymorphous species. A detail relates to the fruiting style which we find somewhat globose-thickened under the stigma. The species occurs in California sparingly, and we have records only as follows: Big Pine, *Heller* 8262; Yreka (Ann. Mo. Bot. Gard. 9:273).

Var. **milleflorum** Payson. Leaves tending to be subentire or merely dentate; racemes with ascending pedicels, flowers and pods.—Northern part of the Great Basin, entering California in eastern Sierra Co. (Sierra Valley, acc. Payson, Ann. Mo. Bot. Gard. 9:275).

Refs.—THELYPODIUM LACINIATUM Endl.; Walp. Rep. 1:172 (1842); Jepson, Man. 412 (1925). *Macropodium laciniatum* Hook. Fl. Bor. Am. 1:43 (1829), type loc. Wallawalla and

Priest's Rapids, Columbia River, *Douglas*. Var. MILLEFLORUM Payson, Ann. Mo. Bot. Gard. 9:273 (1922). *T. milleflorum* Nels. Bot. Gaz. 52:263 (1911), type loc. New Plymouth, Ida., *Macbride* 234.

3. **T. flavescens** Wats. Stem 1 to 4 feet high, simple or with several much elongated simple branches; herbage glaucous and glabrous, or somewhat hispidulous; leaf-blades ovate to oblong-lanceolate, irregularly denticulate or toothed, or sometimes with 2 to 4 pairs of broad salient lobes, sometimes markedly pinnatifid, 4 to 8 inches long, the lowest on petioles 1 to 2 inches long, the upper linear-lanceolate, sharply serrate or denticulate, 1 to 4 inches long, sessile; petals white, usually much exceeding the sepals, the claw broad and the undulate limb narrow; pods ascending, 1¼ to 3 inches long, ¾ line wide.

Open valley floors or steep slopes of low hills, 50 to 2000 feet: Solano Co. to eastern Contra Costa Co. and eastern Alameda Co., and south to San Benito Co. Mar.-Apr.

Tax. note.—This plant is another of the species which have fluctuated between Thelypodium and Streptanthus. We have retained it in the former genus, though its flower is somewhat streptanthoid. In Streptanthus it seems related to Streptanthus pilosus Jepson and S. hallii Jepson. The stem is occasionally fistulous as in specimens from Antioch. The stem hairs are short-bristly and distinctly thickened downward. The cauline leaves are sessile, not auriculate as in Streptanthus. The petals are dull white, perhaps never "yellow"; the limb is trough-shaped, its margin undulate or sometimes not at all so. The anthers on dehiscence are sagittate, the filaments all free. The ovary is commonly sparsely hirsute with spreading hairs (as in the type specimen) or with only a few scattered hairs or sometimes quite glabrous. The pods are commonly glabrous. Mature fruit is seldom collected. The type was collected in California in 1831 by Douglas. The original description specifies "Monterey", but the type sheet (Herb. Hook., Royal Botanic Gardens) carries no such indication. It is essentially improbable that the type was collected at Monterey. The species has never been re-collected in that region, so far as we know. Indeed, we have not thus far seen a Douglas (California) specimen which carries on the herbarium sheet a definite station as recorded by Douglas. It has been thought by some that Douglas visited Mt. Diablo. The circumstance of Thelypodium flavescens would give color to the view that he penetrated as far east as the inner South Coast Range. At Kew a tiny plant of Streptanthus hispidus Gray, a species known only from the inner South Coast Range, is mounted with one of the T. flavescens collections made by Douglas. Of all our specimens the plants from Willow Creek School, San Benito River (*Mason* 5529), are nearest the Douglas type, especially in leaf character and in the scarcely undulate petals.

In the northerly parts of its range Thelypodium flavescens is relatively rare in individuals. In the inner South Coast Range, southward, it occurs in dense well-defined colonies, chiefly on steep hillslopes where the light clay soil is highly friable. These colonies are 10 to 200 yards across. One such very dense stand, the plants 2½ to 3½ feet high, inhabits the steep slope that rises from the San Benito River bottom on its east bank one and one-half miles northerly from the Willow Creek School, where it is associated with Monolopia major DC. and Phacelia tanacetifolia Benth. On the east side of Little Rabbit Valley, San Benito Co., a large sharply defined colony of five or six acres was found in 1932. In the inner South Coast Range south of San Benito Co., Thelypodium flavescens seems to be replaced by Thelypodium lemmonii.

Locs.—Main Prairie, Solano Co., *Jepson* 13,402; Benicia Hills, *Sonne;* Montezuma Hills, *Jepson* 13,403; Collinsville; Antioch, *Davy* 969; Clayton, *Chesnut & Drew;* Livermore (e. of), *Greene;* Corral Hollow, *May Arnold;* Willow Creek School (1½ miles n. of), on hillslope rising from San Benito River bed, *Jepson* 16,126; Little Rabbit Valley, San Benito Co., *Jepson* 16,133.

Refs.—THELYPODIUM FLAVESCENS Wats. Bot. King 25 (1871); Greene, Fl. Fr. 263 (1891); Jepson, Man. 412 (1925). *Streptanthus flavescens* Hook. Ic. Pl. t. 44 (1836), type from Cal., *Douglas,* almost surely not "Monterey"; Torr. Pac. R. Rep. 4:65 (1854), Benicia, *Bigelow. T. greenei* Jepson, Fl. W. Mid. Cal. 212 (1901), ed. 2, 181 (1911). *T. flavescens* Jepson, ll.cc. *Streptanthus flavescens* Gray, Proc. Am. Acad. 6:186 (1864). *S. procerus* Brew.; Gray, Proc. Am. Acad. 6:519 (1865), type loc. coal-mine near Mt. Diablo, *Brewer* 1127 (the number as shown in Gray Herb.). *Caulanthus procerus* Wats. Bot. King 27 (1871). *T. procerum* Greene, Fl. Fr. 263 (1891). *T. hookeri* Greene, l.c. *Caulanthus flavescens* Payson, Ann. Mo. Bot. Gard. 9:301 (1922). *Guillenia flavescens* Greene, Lflts. 1:228 (1906). *G. hookeri* Greene, l.c. The above citations illustrate the extent to which synonymy can accumulate about a species that is not really very variable, but whose generic status is uncertain.

4. **T. lemmonii** Greene. Stem simple or with few erect branches, 1 to 3 feet high; herbage glabrous, glaucous; blades of lower leaves oblong, repand-dentate

or shallowly (or sometimes sinuately) pinnatifid with a few coarse salient lobes at the middle and below, 2 to 7 inches long, contracted to a petiole ½ to 2 inches long; blades of upper leaves lance-linear, attenuate at both ends, sessile; racemes in anthesis somewhat dense, soon becoming loose; flowers 2 to 2½ lines long, the parts spreading, the sepals and petals nearly or quite rotate; sepals dark lavender with white margins, carinate, hooded at apex; petals pale lavender with deeper veins, obovate or cuneate-oblong, only slightly longer or slightly shorter than the sepals; anthers yellow or purple; capsule slender or subfiliform, 2 to 2¼ inches long; pedicels glabrous; stigma small, 2-lobed.

Open hill slopes or plains in heavy black adobe or friable gray clays, 700 to 3000 feet: inner South Coast Range from western San Joaquin Co. to southeastern San Luis Obispo Co. Mar.-June.

Note on relationship.—Thelypodium lemmonii, an excellent species, has been somewhat rarely collected. It grows in colonies of about one-quarter to three acres usually, which favor the friable clays of steep hill slopes. The colonies are commonly rather densely populated and rather well defined. It seems likely that they are on the whole well isolated with reference to each other. We have observed them only at intervals of about six to twenty miles.

While differing very strongly from Thelypodium laciniatum, the type of the genus, Thelypodium lemmonii seems nevertheless more at home in Thelypodium than in Streptanthus. The petals are nearly rotate, while the linear sepals are exactly and somewhat stiffly rotate, filling the intervals between the petals. The flower is thus not at all streptanthoid, either considered as a whole or in relation to the petals which are nearly plane or only slightly cupped, not at all crisped and without any differentiation into claw and limb. On the whole the flowers are fairly thelypodioid, especially as compared with those of Thelypodium brachycarpum Torr. The filaments are terete, quite distinct and slightly fleshy; they are rarely a little hairy. In one colony, as observed in the Yeguas Hills, where the plants are all of one aspect and habit, with uniform leaf, raceme and flower characteristics, some flowering axes show closely erect pods, other axes show reflexed pods, other axes still show spreading pods (*Jepson* 16,203). The flowers are sometimes obviously a little "physiologically bilabiate" as to position of the petals which stand in pairs: those of the lower pair spread a little right and left, those of the upper pair are slightly divergent and turned backward. A colony of these plants is slightly fragrant during anthesis.

Locs.—Tracy (Fl. Fr. 263); Zapato Chino Creek, sw. Fresno Co., *T. Brandegee;* Diablo Range, sw. Fresno Co., *Jepson* 15,391; Cholame, *Lemmon* 4572; Estrella plain, *Barber;* upper Waltham Creek, w. Fresno Co., *Jepson* 16,160; Palo Prieto Cañon, e. San Luis Obispo Co., *Jepson,* 16,198; Yeguas Hills, n. of Carrizo Plain, *Jepson* 16,203; Sumner ranch, Bitterwater Creek, Temblor Range, *Jepson;* Carrizo Plain, opp. Elkhorn Scarp, *Jepson* 16,219; Cuyama, se. San Luis Obispo Co., *Eastwood.*

Refs.—THELYPODIUM LEMMONII Greene, West Am. Sci. 3:156 (1887), type loc. Lemmon's ranch, Cholame, San Luis Obispo Co., *Lemmon;* Fl. Fr. 263 (1891); Gray, Syn. Fl. 1:178 (1895); Jepson, Man. 412 (1925). *Caulanthus anceps* Payson, Ann. Mo. Bot. Gard. 9:303 (1922).

5. **T. lasiophyllum** Greene. Stem simple, or branching above, ½ to 6 feet high; herbage hispid with scattered hairs or nearly glabrous above; blades of lower leaves sinuately pinnatifid with mostly acute denticulate or entire segments, 2 to 10 inches long, the upper lanceolate, less lobed or merely denticulate, all petioled, or the upper rarely sessile; raceme very densely flowered, much elongated in fruit; pedicels 1 line long; petals white, yellowish, or sometimes roseate, 1½ to 2 lines long; sepals oblong, scarcely the length of the narrow petals; pods straight or somewhat curved, strictly deflexed, 2 to 4 inches long, ¼ to ½ line wide.

Open foothills, good soil, 50 to 2100 feet: coastal Southern California; Colorado and Mohave deserts; Coast Ranges and their bordering plains, mostly toward the interior. North to Washington. Apr.

Variation and geographic range.—This species is fluctuatingly variable in nearly every gross character. The plants vary greatly in size and are especially luxuriant on "burns." The leaves are notoriously variable and exhibit a wide range in pinnate division; they are glabrous to hirsute and vary greatly in size. The flowers vary in color. The petals show a range of variation from oblong-spatulate to linear in plants growing side by side (Howell Mt., *Tracy* 1500, 1500½). The pods vary from very slender to stout, from straight to much curved, assume very diverse positions, and vary much in length. These variations, however, occur without any apparent or definite relation to the geographic distribution of the species in the California coastal region.

While most Thelypodium species are inclined to be infrequent in individuals, this species is one of the most common and widely distributed native plants of its immediate alliance in the Coast Range hills, especially toward the inner range, but has never been collected in the Sierra Nevada foothills north of Tulare Co. so far as known to us. It extends south to San Diego Co. and in a slightly or obscurely modified form through the Mohave Desert eastward to Utah. Likewise it ranges north to Washington. Its preference for the Coast Ranges as against the Sierra Nevada foothills is all the more remarkable in that it extends so far beyond the Coast Ranges proper to the north and to the south without obvious modification. It may be hazarded that slightly higher winter or spring temperatures in the Sierra Nevada foothills account for its absence in that range. The varieties named below are of little importance morphologically.

Locs.—S. Cal.: Vallecito, *Jepson* 8598; Blair Valley, e. San Diego Co., *Jepson* 8676; Cuyamaca Mts., *Newlon* 359; Campo, *Abrams* 3573; San Diego, *Jones* 2634; Painted Cañon ne. of Mecca, *Jepson* 11,657; Arroyo Seco, Los Angeles, *Peirson* 327; Hesperia, *Newlon* 469; Antelope Valley, *Davidson;* Mohave sta., *Heller* 7751; Ord Mt., *Jepson* 15,504. Coast Ranges: Zapato Chino Creek, sw. Fresno Co., *Jepson* 15,365; Paso Robles, *Barber;* Carmel, *Heller* 6586; Crystal Sprs., San Mateo Co., *C. F. Baker* 459; Los Buellis Hills, *R. J. Smith;* Berkeley, *Tracy* 599; Livermore, *Bioletti;* Mt. Diablo, *Jepson* 9219; Briones Hills, *Chandler;* Montezuma Hills, Solano Co., *Jepson;* Gates Cañon, Vaca Mts., *Jepson* 13,349; Napa Range e. of Calistoga, *Jepson* 13,347; Santa Rosa, *M. S. Baker;* South Mill Creek, e. of Ukiah, *Jepson* 9225; Blue Lakes, Lake Co., *Jepson* 13,350. West side of the Great Valley: Maricopa, Kern Co., *Jepson* 12,166; Huron, w. Fresno Co., *C. V. Meyer* 266; Bethany, w. San Joaquin Co., *C. F. Baker* 2791; Colusa, *Chandler* 807.

Var. **inalienum** Rob. Pods slender, erect or spreading.—Solano Co. to San Luis Obispo Co. as follows: Vacaville, *Jepson* 13,352, 13,353; Livermore, *Greene;* San Luis Mt., *Summers.* This variety differs from var. rigidum because of its slender pods and from the species because of its erect pods, but these characters, looking toward the species, are inconstant.

Var. **rigidum** Rob. Plant rigid, often glabrous; pods stout, rigid, deflexed-spreading, somewhat spinescent; pedicels ½ line long.—Glenn Co. to eastern Contra Costa Co. as follows: Willows, *Jepson,* 13,351; Main Prairie, Solano Co., *Jepson* 13,345; Livermore, *Greene.* Pods often broadest at base and tapering to apex; they may be ascending, spreading and descending on one raceme.

Var. **utahense** Jepson. Leaf-blades thin, rather more glabrous than in the species, the lobes rounded (mostly acute in the species); fruiting raceme sparse; pods slender, very rigidly and angularly divaricate, and straight or sometimes a little curved.—Colorado and Mohave deserts. East to Utah. This is an inconstant form which is scarcely tenable. The specimens representing it vary amongst themselves about as much as they do collectively from the species. Intermediates to the species occur in the Colorado Desert. It is not uncommon in the deserts. Eastern San Diego Co.: Vallecito, *Jepson* 8574, 8599; Mason Valley, *Jepson* 8712; Blair Valley, *Jepson* 8677c; Wagon Wash near Sentenac Cañon *Jepson* 12,477. Utah: St. Thomas, *Goodding* 700.

Refs.—THELYPODIUM LASIOPHYLLUM Greene, Bull. Torr. Club 13:142 (1886), Man. Reg. S. F. Bay 19 (1894); Jepson, Fl. W. Mid. Cal. 212 (1901), ed. 2, 180 (1911), Man. 412, fig. 406 (1925). *Turritis lasiophylla* H. & A. Bot. Beech. 321 (1840), type from Cal., *Douglas. Guillenia lasiophylla* Greene, Lflts. 1:227 (1906). *Sisymbrium reflexum* Nutt. Jour. Acad. Phila. n.s. 1:183 (1847), type loc. near San Pedro, Cal., *Nuttall,* and Proc. Phil. Acad. 4:25 (1848); B. & W. Bot. Cal. 1:41 (1876). Var. INALIENUM Rob.; Gray, Syn. Fl. 1^1:177 (1895), type loc. Nipoma, *Brewer* 417; Jepson, Fl. W. Mid. Cal. 212 (1901), Man. 413 (1925). *Guillenia inaliena* Greene, Lflts. 1:228 (1906). *Sisymbrium acutangulum* B. & W. Bot. Cal. 1:41 (1876), not DC. Var. RIGIDUM Rob.; Gray, Syn. Fl. 1^1:177 (1895); Jepson, Fl. W. Mid. Cal. 212 (1901), Man. 413 (1925). *T. rigidum* Greene, Pitt. 1:62 (1887), type loc. Antioch, *Greene. Guillenia rigida* Greene, Lflts. 1:228 (1906). Var. UTAHENSE Jepson, Man. 413 (1925). *T. utahense* Rydb. Bull. Torr. Club 29:233 (1902), type loc. St. George, Utah, *Jones* in 1880.

6. **T. longirostris** Jepson. Stem much-branched, 1 to 1½ feet high; herbage glabrous and glaucous; leaf-blades lanceolate to linear-lanceolate, the lower repand-dentate, the upper entire, all contracted to a short petiole, the whole 1 to 2½ inches long; flowers 2 to 2½ lines long, pale yellow or pinkish, soon reflexed, borne on slender pedicels ½ to 1 line long; sepals green, or somewhat purplish-tinged, scarious-margined; petals pale yellow or pinkish, narrow, limb very short, narrower than the expanded summit of the claw; pods curved or straight, divaricate or deflexed, nerved, 1 to 1½ inches long, ¼ to ½ line wide, tapering to a beak 1 to 3 lines long; seeds winged.

Sandy soil, 10 to 5700 feet: Monterey Co.; Inyo Co.; south to the Mohave and Colorado deserts. East to Arizona and Nevada, south to Sonora. Mar.-Apr.

Note on the flower.—The upper pair of stamens (closely approximate) are the longest, the lower pair are next in length, the lateral pair are shortest. The flowers are very promptly reflexed.

Locs.—Soledad, Monterey Co., *Jones* 3129; Caliente, Kern Co.; Lancaster, *Elmer* 3625; Kramer, Mohave Desert, *Jepson* 5333; Barstow, *Parish* 9665; Calico Wash ne. of Barstow, *Jepson* 6702; Laws, Inyo Co., *Heller* 8183; Argus Mts., *Hall & Chandler* 7095; Beaumont, Riverside Co., *R. J. Smith* 102; Whitewater, *S. B. & W. F. Parish* 20; Mecca, *Parish* 8473. Fallon, Nev., *Blanche Ross* 43.

Refs.—THELYPODIUM LONGIROSTRIS Jepson, Man. 413 (1925). *Streptanthus longirostris* Wats. Proc. Am. Acad. 25:127 (1890); Gray, Syn. Fl. 1¹:170 (1895). *S. longifolius* var. *glaber* Torr. Pac. R. Rep. 4:65 (1857), type loc. sandy hills, Colorado River, Ariz., *Bigelow*. *Arabis longirostris* Wats.; B. & W. Bot. Cal. 1:31 (1876). *Euklisia longirostris* Rydb. Bull. Torr. Club 33:142 (1906). *Guillenia rostrata* Greene, Lflts. 1:228 (1906). *G. longirostris* Greene; Hel. Muhl. 2:200 (1906). *Streptanthella longirostris* Rydb. Fl. Rocky Mts. 364 (1917).

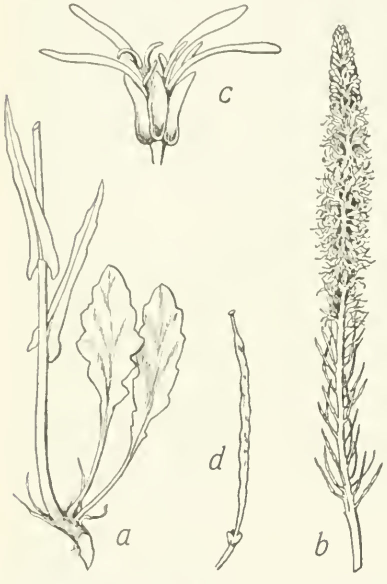

Fig. 132. THELYPODIUM BRACHYCARPUM Torr. *a*, base of plant, × ⅓; *b*, infl., × ⅓; *c*, fl., × 3; *d*, pod, × 1½.

7. **T. brachycarpum** Torr. (Fig. 132.) Stem simple or branched, stoutish, 1½ to 6 feet high; herbage glabrous and glaucous, or the stems at base and the petioles of the basal leaves hirsute, usually sparsely; blades of basal leaves oblong or oblanceolate, sinuate-toothed, pinnatifid or entire, 1 to 4½ inches long, on petioles half as long; blades of cauline leaves narrow-lanceolate, mostly entire, sagittate-clasping, 1 to 2½ inches long; racemes spike-like, very dense; pedicels in fruit 1 to 1½ lines long; sepals broadly linear at first, linear-lanceolate in anthesis, scarious-margined and somewhat crisply margined; petals white, linear-elongated, 2½ to 3½ lines long, over twice or nearly twice as long as the sepals; stamens exserted; pods slender, terete, slightly knotted, sharply beaked, ascending, from 6 to 12 lines long.

Sandy soil, mountain sides and valleys, 4800 to 7200 feet: north end or east slope of the Sierra Nevada from Siskiyou Co. to Inyo Co. East to Nevada. May-Aug.

Locs.—Siskiyou Co.: Yreka, *W. L. Kleaver;* Montague, *Heller* 8011; Shasta Valley, *Butler* 1850.

The plants east of the Sierra Nevada crest from Inyo Co. to Lassen Co., thence east into Nevada, have been referred by E. B. Payson to T. crispum Greene. The descriptions of T. brachycarpum and T. crispum as given by Payson (Ann. Mo. Bot. Gard. 9:263–4) are, with herbarium sheets before one, practically identical except for character of the pedicels. He gives for T. brachycarpum, "pedicels stout, divergent, 1–2 mm. long," for T. crispum, "pedicels slender, erect, 3–5 mm. long." In specimens of T. crispum from nw. Cal. (Mono Lake, *Brewer* 1819; Purdy, Sierra Co., *Heller & Kennedy* 8671; Milford, *T. Brandegee;* all determined as T. crispum by Payson), the pedicels are 2 to 2½ mm. long, none 3 to 5 mm. long. In general the pods are at first spreading, tending to be ascending in age. In genuine T. brachycarpum, as represented by *Butler* 1850 (Shasta Valley), the type region, the pods are, in age, widely spreading but in *Hall & Babcock* 4092 from the same locality they are ascending as in typical T. crispum. The pedicels in the Siskiyou Co. material are more divergent and usually stouter than in the specimens referred to T. crispum and on this character the more strictly transmontane representation (with slender erect pedicels) may be segregated as var. **crispum** Jepson comb. n. The following specimens may be cited: Amedee, Lassen Co., *Davy;* Milford, Lassen Co., *T. Brandegee;* Dixey Valley, Lassen Co., *Baker & Nutting;* Beckwith Pass, *Jepson* 7756; Purdy, Sierra Co., *Heller & Kennedy* 8671; McFarland's Mill, road to Hot Sprs., Placer Co., *Sonne;* Mono Lake, *Brewer* 1819; Bishop, *Al-*

meda Nordyke; Silver Lake, and up to Gem Lake, 9100 feet, Mono Co., acc. *Peirson.* Fallon, Nev., *Blanche Ross* 35.

Refs.—THELYPODIUM BRACHYCARPUM Torr. Phanerogamia of Pacific Coast, Wilkes Expl. Exped. 231, t. 1 (1874), type loc. Klamath River, "s. Ore."; Gray, Proc. Am. Acad. 6:520 (1865), his diagnosis based on "valley of Mono Lake," *Brewer;* Jepson, Man. 413 (1925). Var. CRISPUM Jepson. *T. crispum* Greene; Payson, Ann. Mo. Bot. Gard. 9:264 (1922), type loc. Eagle Valley, Ormsby Co., Nev., *C. F. Baker* 1191.

8. **T. howellii** Wats. Stem simple or branching, 1½ to 2½ feet high; herbage glabrous and glaucous, or hirsute near the base; blades of basal leaves entire or repand, with the winged petiole toothed; blades of cauline leaves linear to lanceolate, sagittate-clasping, entire, erect, ¾ to 3 inches long; flowers 3½ to 4½ lines long; sepals saccate, oblong, acuminate, white-margined, the lateral pair strongly hooded or horned at apex; petals white, flesh-color or purple, narrowly linear with crisped limb; stamens with the filaments of the 2 longer pairs commonly though not always connate; anthers sagittate, strongly curled after anthesis; pods slender, nearly erect, 1 to 2 inches long, tipped by the rather slender style ½ line long; stigma small, obscurely 2-cleft.

Valley meadows, 4000 to 5000 feet: Lassen and Modoc Cos. North to eastern Oregon and Washington. June-July.

Locs.—Dixey Valley, Lassen Co., *Baker & Nutting;* Big Valley, Modoc Co., *Baker & Nutting.*

Refs.—THELYPODIUM HOWELLII Wats. Proc. Am. Acad. 21:445 (1886), based on spms. from Camp Polk and Harney Valley, Ore., *Howell;* Jepson, Man. 413 (1925). *T. simplex* Greene, Pitt. 4:200 (1900), type loc. Dixey Valley, Lassen Co., *M. S. Baker.*

9. **T. stenopetalum** Wats. Stem simple or branching from the base, 1 to 2 feet high; herbage glabrous and glaucous; leaf-blades oblong to lanceolate or linear, auriculate-clasping, 1 to 2 inches long, the blades of the basal obovate, scarcely petioled; flowers narrow, 4 to 5 lines long; petals white or pinkish, narrow-oblanceolate, a little crisped at apex, slightly exserted; pods slender, ascending, 1¾ to 2¼ inches long; stigma slightly 2-lobed.

Stony slopes, 6800 feet: San Bernardino Mts. June.

Loc.—Bear Valley, *Parish,* 3787.

Refs.—THELYPODIUM STENOPETALUM Wats. Proc. Am. Acad. 22:468 (1887), type loc. Bear Valley, San Bernardino Mts., *Parish;* Jepson, Man. 413 (1925).

10. **T. flexuosum** Rob. Stems slender, subnaked, few or several from a thick root-crown, erect or ascending, sparsely leafy with few reduced or bract-like leaves, 7 to 13 inches high; herbage glabrous; blades of basal leaves oblong to narrow-ovate, obtuse, entire, ¾ to 2 inches long, narrowed at base to a petiole about half as long; cauline leaves few, their blades lance-linear, reduced or bract-like, sagittate-sessile; racemes 1 to 2 inches long; flowers 3 to 3½ lines long; petals pale purplish or white, obovate, nearly twice as long as the sepals; pods irregularly torulose, reticulate, ¾ to 1 or "3" inches long.

Alkaline valleys and meadows, 3000 to 5000 feet: northwestern Nevada to eastern Oregon, entering California in eastern Modoc Co. May.

Locs.—Surprise Valley, Modoc Co. (Syn. Fl. 1^1:175). Ore.: Harney Valley, *Howell* 341; Powder River, *Cusick* 1884.

Refs.—THELYPODIUM FLEXUOSUM Rob.; Gray, Syn. Fl. 1^1:175 (1895), type loc. Carson City, Nev., *Anderson* (the first-cited spm.); Payson, Ann. Mo. Bot. Gard. 9:271 (1922).

11. **T. cooperi** Wats. Stem slender, simple or branching, flexuous, 8 to 23 inches high, or branched and developing elongated tortuous or even serpentine branchlets, the whole 2 to 3 feet long; herbage glabrous; leaves disappearing early, their blades oblong-obovate to linear-oblong or linear-lanceolate, mostly entire, the blades of the cauline sagittate-clasping, those of the basal contracted to a short petiole, the whole 1 to 2½ inches long; flowers narrow, 3 to 4 lines long; sepals

greenish, turning purplish; petals yellow, aging dull white with purple center, about 1½ times as long as the sepals; pods terete, torulose, especially on upper half, commonly falcate or tortuous, attenuate at apex, glabrous, widely divaricate or more or less deflexed, ¾ to 1 inch long; style 1 to 1¼ lines long; stigma almost entire; pedicels ½ to 1 line long; seed not winged.

Desert mesas or washes, 1300 to 7000 feet: Inyo Co. and south through the Mohave Desert to the Colorado Desert. East to Arizona. Apr.

Note on relationship.—A peculiar species which would rest as well in Streptanthus. The petals usually have a broader claw than lamina with a constriction between them which is a streptanthoid character rather than a thelypodioid one. The upper sepals, in addition, are usually slightly longer than the lower, this irregularity being a streptanthoid character. The calyx has the urceolate shape so often found in Streptanthus. It is, on the whole, a species intermediate between Thelypodium and its nearest generic ally, or it might well be considered a primitive Streptanthus.

Locs.—Pleasant Cañon, Panamint Range; Lee Well, Nelson Range; Randsburg, *Heller* 7680; Newberry, *Newlon* 504; Ord Mt., *Jepson* 15,501; Jimgrey, *Jepson* 15,563; Stoddard Well, *Parish* 11,797; Hesperia, *Newlon* 468; Cottonwood Mts., n. of Mecca; Palm Cañon, Mt. San Jacinto, *Newlon* 455; Blair Valley, e. San Diego Co., *Jepson* 8672; Wagon Wash near Sentenac Cañon, e. San Diego Co., *Jepson* 12,478. Chloride, Ariz., *Jones*.

Refs.—THELYPODIUM COOPERI Wats. Proc. Am. Acad. 12:246 (1877), type loc. near Ft. Mohave, Ariz., *J. G. Cooper;* Jepson, Man. 414 (1925). *Guillenia cooperi* Greene, Lflts. 1:228 (1906). *Caulanthus cooperi* Payson, Ann. Mo. Bot. Gard. 9:293 (1922).

4. **HALIMOLOBUS** Tausch.

Canescent herbs. Leaves entire or more or less dentate or sinuate-dentate, the basal ones petioled, the cauline ones sessile or with a short winged petiole. Petals in ours white, the limb elliptic or obovate, gradually drawn down to a narrow claw about as long. Pod slender, terete, in ours slightly torulose.—Species about 11, North and South America. (Greek alimos, salt, and lobos, a pod, the habit of these plants thought to recall Alyssum halimifolium Willd.)

1. **H. diffusus** O. E. Schulz. Stem diffusely branched, often flexuous above, 1 to 2 feet high; herbage ashy with a fine more or less stellately branching pubescence; leaf-blades ovate, sinuate to dentate, 1 to 3¼ inches long, shortly petioled or subsessile; petals white, 2½ lines long, slightly exceeding the sepals; the limb roundish-obovate; sepals tomentulose; pods slender or subfiliform, "4 to 5 lines long", spreading or almost divaricate, borne on nearly horizontal pedicels; rib of septum broad.

Dry washes or granite rocks, 4000 to 7000 feet: Inyo Co. East to western Texas. May-June.

Tax. note.—This is an anomalous species which rests not well in Sisymbrium. No species with forked pubescence occurs in Thelypodium and yet in habit and in aspect, in the character of its pods and their arrangement, there is much that is suggestive of that genus. "In Westgard Pass it was a rather large brushy plant growing on a steep rocky precipice along the road. I had quite made up my mind that it was a Thelypodium and I still think it looks more like one than it does a Sisymbrium."—F. W. Peirson in litt.

Locs.—Silver Cañon, White Mts., *Duran* 1509; Westgard Pass, *Peirson* 7539; Deep Spring Valley, ne. Inyo Co., *Purpus* 5815; Coso Mts., s. Inyo Co. (Contrib. U. S. Nat. Herb. 4:63).

Refs.—HALIMOLOBUS DIFFUSUS O. E. Schulz; Engler, Pflzr. 4^{105}:288 (1924). *Sisymbrium diffusum* Gray, Pl. Wright. 1:8 (1852), type loc. Limpia Pass, Tex., *Wright;* Syn. Fl. 1^1:138 (1895).

5. **SISYMBRIUM** L.

Erect herbs frequently with pinnatifid or finely dissected leaves, the base not clasping or auriculate. Flowers small (⅔ to 2½ lines long), yellow or white. Sepals oblong or linear, equaling or exceeding the claws of the petals. Pod linear or oblong, terete or nearly so, the valves more or less distinctly 3-nerved; stigma sessile or the style very short. Cotyledons incumbent.—About 30 species, all continents. All of our species are annual, though no. 3 is sometimes biennial. (Greek sisumbrion, the ancient name of some plant of this family.)

- Pods closely appressed, subulate; seeds in 1 row; leaves pinnatifid..............1. *S. officinale.*
- Pods spreading.
  - Pods elongated-linear or thread-like, 2 to 4 inches long; seeds in 1 row; leaves pinnately parted, dimorphic, the lower with broad lobes, the upper with filiform lobes..............2. *S. altissimum.*
  - Pods ⅙ to 1¼ inches long; leaves not of two distinct sorts on one plant.
    - Leaf-blades not divided, entire, merely dentate or sinuately lobed, mainly in a basal rosette; seeds in 1 row..............3. *S. thalianum.*
    - Leaf-blades deeply divided (that is, pinnate or bi- or tri-pinnate).
      - Seeds in 1 row.
        - Leaves with a large terminal more or less entire lobe and commonly 1 or 2 pair of salient lobes at base..............4. *S. irio.*
        - Leaves divided into many segments.
          - Leaves bi- or tri-pinnately dissected, with linear or linear-lanceolate segments; pods 9 to 15 lines long..............5. *S. sophia.*
          - Leaves pinnate with oblong pinnatifid segments; pods (1½ or) 4 to 8 lines long..............6. *S. incisum.*
      - Seeds in 2 rows.
        - Leaves with finely dissected segments; pods glabrous, 2 to 5 lines long..............7. *S. pinnatum.*
        - Leaves with oblong pinnatifid segments; pods sparsely pubescent, 7 to 9 lines long..............8. *S. cumingianum.*

1. **S. officinale** Scop. HEDGE MUSTARD. Stem rigid, 1 to 4 feet high, with divaricate branches above; herbage a little rough-hispid; leaves lyrately and often somewhat runcinately pinnatifid or pinnately parted with dentate or coarsely toothed segments, petioled, the lowest rosulate and 4 to 10 inches long; petals yellow; pods terete, 6 lines long, tapering from base to summit, nearly sessile, closely appressed to the axis in a long slender raceme.

Naturalized from Europe, a very common weed of waysides, pastures and waste places, 5 to 2500 feet: chiefly cismontane. Apr.-May.

Historical note.—This species probably came into California at a very early day, doubtless during the Franciscan Mission period, but we notice no botanical record of it until it is set down by Torrey as having been collected in 1855 at Benicia by Bigelow (Pac. R. Rep. 4^5:66,—1857). During the last sixty years it has been one of the more abundant weed species in waste lands about towns and settlements.

The following is a field note.—"We are now encamped on Redwood Creek, at Berry ranch, northern Humboldt Co., and an old Redwood Indian is giving in his own tongue to Dr. P. E. Goddard, my companion, the names of the plants about our camp. The Indian has a name for most of the undoubted natives and also for Achillaea millefolium L. and Anthemis cotula L.! But he rejects Sisymbrium officinale L., Capsella bursa-pastoris L. and Centaurea melitensis L. as 'White Man's weeds'. 'When White Man come, he [suiting action to word and picking up a sprig of Centaurea melitensis L., Napa Thistle, from under foot] come plenty', he said."—Jepson Field Book, 8:47 (ms), Hupa Expedition, June 25, 1902.

Locs.—Paskenta, w. Tehama Co., *Jepson* 16,326; Van Duzen River, opp. Buck Mt., *Tracy* 2808; Williams, Colusa Co., *Davy* 4273; Vacaville, *Jepson;* Olema, *Jepson* 13,384; Walnut Creek, *Brewer* 1044; Berkeley, *Jepson;* Shepherd Cove, Tulare Co., *W. Fry* 425; Arroyo Seco, Los Angeles, *Peirson* 2109; San Bernardino, *Parish;* Ramona.

Refs.—SISYMBRIUM OFFICINALE Scop. Fl. Carn. ed. 2, 2:26 (1772); Jepson, Fl. W. Mid. Cal. 215 (1901), ed. 2, 183 (1911); Man. 420 (1925). *Erysimum officinale* L. Sp. Pl. 660 (1753), type European.

2. **S. altissimum** L. TUMBLING MUSTARD. Stem erect, much branched above, 2 to 3½ feet high; herbage nearly glabrous or sparsely hirsute below; leaves pinnately parted; lower leaves large, petioled, the lobes ¼ to 1 inch broad, entire or dentate; upper leaves reduced, with linear or filiform segments; petals yellowish, fading white, 3 lines long; pods spreading, linear or subfiliform, 3 to 4 inches long, on stout pedicels.

Introduced European weed, rapidly becoming distributed all over California at middle and low altitudes. May-Aug.

Tax. note.—The difference between the broad lobes of the basal leaves and the filiform divisions of the upper leaves is very striking. In age the branches and pods become very rigid and somewhat spreading or divaricate. The pods are quite glabrous or essentially so, with a replum which is slightly prominent and rounded.

Introduction note.—This species with us first appeared near the coastal towns of Southern California about 1910 (Parish, Bull. S. Cal. Acad. 19^4:18) and is now established in widely scattered localities throughout the state. It came in earlier in Washington and Idaho where, it has been thought, its appearance was due to introduction from the eastern United States through the building of the Northern Pacific Railroad by James J. Hill. The folk of those states in consequence call this weed Jim Hill Mustard, as do settlers in Siskiyou County, California, where the writer first observed plants along the railway lines in 1914.

Locs.—Laguna Mts., *Peirson;* Henniger Flats, San Gabriel Mts., *Peirson* 61; Claremont, *D. L. Crawford;* Redlands, *Jepson* 5538; Lytle Creek Wash, *Parish* 11,141; Tehachapi Pass, *H. L. Bauer;* Rabbit Valley, San Benito Co., *Jepson* 12,242; San Francisco, *H. A. Walker* 5014; Sonoma, *R. Kuhn;* Andrews Camp, Inyo Co., *K. Brandegee;* Cape Horn, Nevada Co., *Essig;* Weott, Humboldt Co., *Jepson* 16,530; Sisson, *Jepson* 5790; Yreka, *Kleaver.*

Refs.—SISYMBRIUM ALTISSIMUM L. Sp. Pl. 659 (1753), type European; Gray, Syn. Fl. 1^1:137 (1895); Parish, Muhl. 9:58 (1913), Bull. S. Cal. Acad. 14:15 (1915); Dav. Bull. S. Cal. Acad. 13:44 (1914); Jepson, Man. 421 (1925). *Norta altissima* Britt.; Britt. & Br. Ill. Fl. ed. 2, 2:174, fig. 2060 (1913).

3. **S. thalianum** J. Gay. THALE CRESS. Stems one or several from the base, slender, erect, branching above, 9 to 13 inches high, glabrous above, hirsute below with spreading hairs; leaf-blades of the basal rosette obovate to oblong, entire or nearly so, thinly stellate-puberulent, ¼ to ½ inch long, narrowed to petioles ½ to as long; cauline leaves few, sessile, mainly hirsute-ciliate; racemes open; petals spatulate, very obtuse or truncatish, white, ¾ line long; pods linear, 4 to 5 lines long, on spreading pedicels 2 to 3 lines long.

Open ground: Alameda, Lake and Trinity Cos. Introduced from Europe. Apr.

Locs.—Berkeley, *Morton* 545, beginning to be established in protected areas in 1926; Knoxville grade to Lower Lake (= f. glabrescens Briq.), *Jepson* 13,415 in 1892; Oregon Gulch Mt., Trinity Co., *Tracy* 7537 in 1927.

Refs.—SISYMBRIUM THALIANUM J. Gay, Ann. Sci. Nat. ser. 1, 7:399 (1826). *Arabis thaliana* L. Sp. Pl. 665 (1753), type from n. Eur. *Arabidopsis thaliana* Heynh.; Holl. & Heynh. Fl. Sachs. 1:538 (1842); Britt. & Br. Ill. Fl. ed. 2, 2:176, fig. 2063 (1913). f. GLABRESCENS Briq. Prod. Fl. Cors. 2: 38 (1913), stem and cauline leaves glabrous.

4. **S. irio** L. LONDON ROCKET. Stem erect, branching above the base, 1½ to 2 feet high; herbage glabrous; leaf-blades ovate or lanceolate in outline, 1 to 4 inches long, commonly pinnately parted or divided into 1 or 2 pairs of lobes below the large terminal segment which is coarsely toothed to subentire, the petioles ½ to 1¼ inches long; flowers in a dense raceme, the raceme in fruit becoming loose; petals white; pods spreading, narrowly linear, 1¾ to 2 inches long.

European weed, introduced into waste lots and orchards in coastal Southern California. Jan.-Feb.

Locs.—Claremont (in 1923); Upland and Ontario (in 1918), Bull. S. Cal. Acad. 17:65; Pasadena (in 1926); Yorba Linda, *G. Byron Deshler* (in 1929).

Refs.—SISYMBRIUM IRIO L. Sp. Pl. 659 (1753), type European; Parish, Bull. S. Cal. Acad. 19^4:18 (1920). *Norta irio* Britt.; Britt. & Br. Ill. Fl. ed. 2, 2:174 (1913).

5. **S. sophia** L. FLIX-WEED. Stem branching above the base, 1¼ to 1¾ feet high; herbage finely pubescent with branched hairs; leaves finely bi- or tri-pinnately dissected, the segments linear or lance-linear, ½ to 1½ lines long; pedicels filiform, spreading, 3 to 5 lines long; petals white; pods ascending, narrowly linear, ¾ to 1¼ inches long; seeds in 1 row.

European weed, introduced in northern California but now appearing in Southern California; rare with us. May-June.

Locs.—Truckee, *H. A. Walker* 2139; Warner Mts., *Morton* 629 (in 1925); Alturas, *Taylor & Bryant* (in 1910); Yreka, *Butler* 120 (in 1908), *Kleaver* 1; Monolith, Tehachapi Valley, *Jepson* 11,618 (in 1927).

Refs.—SISYMBRIUM SOPHIA L. Sp. Pl. 659 (1753), type European; Gray, Syn. Fl. 1^1:139 (1895); Jepson, Man. 421 (1925). *Sophia sophia* Britt.; Britt. & Br. Ill. Fl. ed. 2, 2:170, fig. 2051 (1913).

6. **S. incisum** Engelm. Stem 1 to 2½ feet high; herbage stellate-puberulent, obscurely glandular; leaves thin, pinnate (or the upper leaflets not distinct); leaflets incised-pinnatifid, 3 to 14 lines long, the ultimate segments mostly 1 to 3 lines long; petals yellow; pods 6 to 8 lines long, straight or upwardly curved, erect or ascending on widely spreading pedicels; pedicels slightly longer, equaling or slightly shorter than the pods; seeds in 1 row (sometimes indistinctly in 2 rows); style distinct (¼ to ⅔ line long).

Montane, 2000 to 11,500 feet: San Bernardino Mts.; Providence Mts.; White Mts.; Sierra Nevada from Tulare Co. to Placer Co.; Yollo Bolly Mts. to Siskiyou Co. East to Arizona and Tennessee, north to Saskatchewan. May-Aug.

Locs.—S. Cal.: Seven Oaks, San Bernardino Mts., *G. B. Grant* 4049; Providence Mts., *Munz* 3439. White Mts.: Big Prospector Mdw., *J. Grinnell.* Sierra Nevada: Golden Trout Creek, Tulare Co., *Jepson* 4945; Mt. Whitney, *Jepson* 1095; Horse Corral Mdw., Kings Cañon, *Jepson* 765; Bench Mdw., Kaiser Ridge, *Jepson* 13,332; Devil's Postpile, Madera Co., *A. L. Grant* 1556; Benson Lake, Yosemite Park, *Jepson* 4511; Sonora Pass, *A. L. Grant* 155, 275; Emerald Bay, Lake Tahoe, *J. T. Howell* 1118. North Coast Ranges: Soldier Ridge, Yollo Bolly Mts., *Jepson* 13,385; Shackelford Creek, *Butler* 126.

This species is obviously variable in leaf segmentation and in length of pedicels and in form and size of pods. In the extended suite of specimens before us the following varieties are discernible only as extreme forms in a series connected by intergrades, the last named being the most definitely marked.

Var. **filipes** Gray. Primary divisions of the leaves discrete or somewhat remote; upper leaves or sometimes most of them with the terminal segment elongated-linear (mostly ½ to 1 inch long, ½ to 1 line wide) and entire; sometimes, also, with all the segments of the leaves above the basal ones entire; pedicels 5 to 8 lines long, usually longer than the pods.—East side of the northern Sierra Nevada; rare in the southern Sierra Nevada. North to Oregon and Idaho, east to Colorado.

Locs.—Paradise Creek, Kings River, *Newlon* 222; Truckee, *Sonne.* Lewiston, Ida., *Heller* 2969.

Var. **sonnei** Rob. Pods 3 lines long, somewhat acute, on pedicels about as long.—East slope of the Sierra Nevada or in desert valleys: Nevada Co. to Sierra Co.; White Mts. to Kern Co.

Locs.—Sierraville, *Jepson* 8057; Truckee, *Sonne* 526; w. slope Washoe Mts., Nevada Co., *Davy* 3164; Silver Cañon, White Mts., *Heller* 8218; Mohave, *Heller* 7763.

Var. **hartwegianum** Wats. Pods oblong, mostly acutish, short (1 to 2 lines long), on somewhat appressed or nearly erect pedicels, the pedicels about as long.—East slope or easterly areas of the Sierra Nevada, 6700 to 10,000 feet: Tulare and Inyo Cos. to Mono Co. (Cal.) and to Douglas Co., Nev.; White Mts. East to Colorado, north to British Columbia, south to Mexico.

Locs.—Rock Creek, Kern Cañon; Mt. Dana, *H. M. Evans;* Mono Lake, *Brewer* 1850; Silver Cañon near Big Prospector Mdw., White Mts., *Jepson* 7352.

Refs.—SISYMBRIUM INCISUM Engelm.; Gray, Mem. Am. Acad. n. ser. 4:8 (1849), type loc. N. Mex.; B. & W. Bot. Cal. 1:41 (1876); Gray, Syn. Fl. 1^1:139 (1895); Jepson, Man. 421, fig. 413 (1925). *Descurainia incisa* Britt. Mem. Torr. Club 5:173 (1894). *Sophia incisa* Greene, Pitt. 3:95 (1896). Var. FILIPES Gray, Mem. Am. Acad. 4:8 (1849), type loc. Clearwater, Ore., *Spalding.* Var. SONNEI Rob.; Gray, Syn. Fl. 1^1:140 (1895), type loc. Truckee, *Sonne* 19; Jepson, Man. 421 (1925). *Sophia sonnei* Greene, Pitt. 3:95 (1896). *Descurainia californica* O. E. Schulz; Engler, Pflzr. 4^{105}:330 (1924), not *Smelowskia californica* Gray. Var. HARTWEGIANUM Wats.; B. & W. Bot. Cal. 1:41 (1876); Gray, Syn. Fl. 1^1:139 (1895); Jepson l.c. *Sisymbrium hartwegianum* Fourn. Sisymb. 66 (1865), type loc. Mexico, *Hartweg* 38 (acc. Syn. Fl.). *Sophia hartwegiana* Greene, Pitt. 3:95 (1896).

7. **S. pinnatum** Greene. TANSY MUSTARD. Stem ¾ to 2 feet high; herbage ashy-tomentulose or puberulent, sometimes glabrate and green; leaves pinnately or bipinnately dissected; segments elliptic to linear-oblong, ¼ to 1 line long; petals yellow; pods oblong to linear, acute at each end, 2 to 5 lines long, shorter than the

slender spreading or divaricate pedicels; seeds in 2 rows; style very short (⅕ line long) or almost none.

Desert or arid slopes and mesas, 1250 to 8500 feet: n. Humboldt Co.; Siskiyou and Modoc Cos.; north end and eastern slopes or summits of the Sierra Nevada; head of the San Joaquin Valley; south to the Mohave and Colorado deserts, thence west to cismontane Southern California; occasional in the South Coast Ranges; more common southward in our region than northward. East to Virginia. Mar.-May.

Locs.—Humboldt, Siskiyou and Modoc Cos.: Trinity Summit, *Jepson* 2049a; McAdams Creek, *Butler* 895; Klamath River, *Butler* 727; Egg Lake, *M. S. Baker;* Lake City Cañon, *Austin & Bruce* 2246. Sierra Nevada: Donner Lake, *Heller* 6937; Truckee, *Sonne* 6404b; Bloody Cañon, Mono Co., *Chesnut & Drew;* Yosemite Valley, *Blasdale;* Golden Trout Creek, Tulare Co., *Jepson* 4942; Tehachapi, *Davy* 2167. Desert region: Cottonwood Creek, White Mts., *Duran;* Independence, *S. W. Austin;* Hanaupah Cañon, Panamint Range, *Jepson* 7032; Lanfair, *Maye Tennant;* Mohave, *Heller* 7763; Barstow, *Jepson* 5363, 6603; Cottonwood Spr., n. Colorado Desert, *Jepson* 12,572; San Felipe Valley, *Jepson* 8726; Vallecito, *Jepson* 8536. Upper San Joaquin Valley: Huron, *E. O. Campbell;* Eastside canal, Bakersfield, *Davy* 1914. South Coast Ranges: Arroyo Mocho, Alameda Co., *Morton* 811; San Luis Obispo, *Summers.* Cismontane S. Cal.: Canada del Capitan, Santa Barbara coast, *Jepson* 11,905; Santa Cruz Isl.; Santa Susanna Mts., Ventura Co., *Brewer* 205; Saugus, *Davy;* Arroyo Seco, Los Angeles, *Peirson* 309; San Bernardino Valley, *S. B. & W. F. Parish;* Santiago Creek, Santa Ana Mts., *Alice King;* Julian, San Diego Co.; Laguna, San Diego Co., *Cleveland.*

Var. **brachycarpum** Jepson comb. n. Pods oblong, obtusish, 1 to 1½ lines long.—Inyo Co. foothills. North to eastern Oregon and Canada.

Locs.—Bishop, *Heller* 8363. Desert Well, e. Ore., *Leiberg* 389.

Refs.—SISYMBRIUM PINNATUM Greene, Bull. Cal. Acad. 2:390 (1887); Jepson, Fl. W. Mid. Cal. 215 (1901), Man. 421, fig. 414 (1925). *Erysimum pinnatum* Walt. Fl. Car. 174 (1788), type loc. "Carolinas." *Sisymbrium canescens* Nutt. Gen. 2:68 (1818), Va. to Ga.; B. & W. Bot. Cal. 1:40 (1876); Greene, Fl. Fr. 271 (1891); Jepson, Fl. W. Mid. Cal. l.c., ed. 2, 183 (1911). *Sophia pinnata* Howell, Fl. Nw. Am. 56 (1897). *Sophia brevipes* Rydb. Bull. Torr. Club 29:238 (1902). *Sisymbrium incisum* var. *californicum* Blkp. Mont. Agr. Coll. Stud. Bot. 1:60 (1905). *Sophia californica* Rydb. l.c. *Descurainia pinnata* Britt. Mem. Torr. Club 5:173 (1894); O. E. Schulz in Engler, Pflzr. 4^{105}:326, fig. 66 (1924). *D. menziesii* O. E. Schulz, l.c. 328. Var. BRACHYCARPUM Jepson. *S. brachycarpum* Rich.; Franklin, First Journ. ed. 1, app. 744 (1823). *Descurainia paradisa* O. E. Schulz in Engler, Pflzr. 4^{105}:331 (1924), at least as to citation of *Heller* 8363, which has the seeds in two rows.

8. **S. cumingianum** F. & M. Closely resembling stout forms of S. incisum; stem stouter, simple, 3½ feet high, pubescent with short branched hairs; leaves densely canescent-tomentose, their blades ovate or round-ovate in outline, ¾ to 1½ inches long, pinnately divided into 3 or 4 pairs of segments, the segments varying from inequilaterally incised or serrate to entire; petals white; pods narrow, abruptly pointed, sparsely pubescent with branched hairs, 7 to 9 lines long; seeds in 2 rows, lightly compressed.

Thin woodlands or open ground, 4500 to 6500 feet: Mohave and Colorado deserts, and bordering southerly or westerly ranges. East to New Mexico. Chile. June-July.

Locs.—Victorville, *Parish* 10,542; Strawberry Valley, San Jacinto Mts.; Vandeventer, San Jacinto Mts.

Refs.—SISYMBRIUM CUMINGIANUM F. & M. Ind. Sem. Hort. Petrop. 38 (1835), type from Chile; Gray, Syn. Fl. 1^{1}:139 (1895); Jepson, Man. 422 (1925).

6. ISATIS L.

Ours a biennial or perennial herb. Flowers small, yellow, crowded in small panicled corymbs. Pod 1-celled, 1-seeded, indehiscent, winged and strikingly like a samara or ash-fruit.—About 50 species, Europe, Asia. (The classical name).

1. **I. tinctoria** L. DYERS WOAD. Stems branching from or near the base, 1 to 2 (or 3) feet high; herbage somewhat glaucous, glabrous or the lower leaves

sparingly ciliate along the midrib; blades of basal leaves oblong-ovate to lanceolate, entire or remotely serrate, 3 to 4 inches long, on petioles nearly as long; cauline leaves sessile, sagittate at base; flowers 1 to 1½ lines long; stigma broad, sessile; pods 4 to 7 lines long on slender pedicels, erect at first but eventually pendent, becoming dark purple at maturity.

European species, naturalized in Siskiyou Co., a troublesome pest in Scott Valley, springing up from the root when cut down; known locally as Marlahan Mustard.

Locs.—Yreka, *W. L. Kleaver;* Scott River Valley, *Butler* 804.

Refs.—Isatis tinctoria L. Sp. Pl. 670 (1753), type European; Jepson, Man. 422 (1925). For the history of the woad dye industry see J. B. Hurry, "The woad plant and its dye" (pp. 1–328, pls. 1–17. 1930).

7. CAKILE L.

Maritime branching annual with fleshy leaves and rather small purplish or white flowers. Pod fleshy, or when ripe, dry and corky, 1-celled, jointed in the middle, the 2 joints 1-seeded, the upper joint at length deciduous, the lower one persistent. Cotyledons accumbent.—Species 4, sea and lake shores, North America, Europe, tropics. (Arabic name.)

1. **C. edentula** Hook. var. **californica** Fer. Sea Rocket. Stems decumbent, often 2 feet long; leaf-blades oblanceolate or narrowly obovate, crenate or shallowly sinuate-toothed; pod 7 to 12 lines long, the lower segment cylindrical, the upper ovoid and acuminately narrowed to a flattened truncate often retuse beak.

Sea beaches: San Diego to Humboldt Bay; north to Vancouver Island. June-Sept.

Note on indigenous status.—Long regarded as introduced, there is at the present day a tendency on the part of some botanists to regard our Cakile of the California coast as a native plant. There are, however, some plausible reasons of a negative kind for looking upon it as introduced. None of the early explorers (1786–1835) obtained it so far as known to us. H. N. Bolander, a first-rate observer, makes no mention of it in his Catalogue of the Plants of the Vicinity of San Francisco (1870). The genus is not included in the Botany of the California Geological Survey (1876–1880). It is not until a full century after the first botanists examined our shores that Cakile appears in the California literature, when it is recorded by Behr (Fl. Vic. S. F. 224,—1888), who cites only one locality, "Berkeley salt marshes." From this time forward, for reasons often sufficiently obvious in regard to questions of nativity, authors seldom make an explicitly positive statement as to our form of Cakile edentula. Greene says "probably indigenous" (Fl. Fr. 277—1891). In 1892 K. Brandegee includes it in her Catalogue of the Flowering Plants of San Francisco as an alien (Zoe 2:340). In the Synoptical Flora (1^1:132,—1895) Robinson says "perhaps introduced". Millspaugh (Field Mus. Bot. 2:130,—1900) says "introduced". The statement of Fernald (Rhod. 24:23,—1922) implies that it is a native species. At the present day no botanist could collect on the ocean strand of San Francisco County without finding Cakile at nearly any season of the year. If it were an inhabitant of those much-frequented beaches from 1850 to 1870 or 1885, it would seem remarkable that it was not obtained by at least some one of the several botanists of the California Academy of Sciences or by many botanical travelers.

Locs.—San Diego; Newport, Orange Co., *Alice King;* Carmel, *Newlon* 105; Pillar Point, San Mateo Co., *C. F. Baker* 1746; San Francisco, *Jepson* 10,237; West Berkeley, *Bioletti;* Bolinas, *J. T. Howell* 2256; Ft. Bragg, *W. C. Mathews* 161; Samoa, Humboldt Bay, *Tracy* 1266.

Refs.—Cakile edentula Hook. Fl. Bor. Am. 1:59 (1830). *Bunias edentula* Bigel. Fl. Bost. 157 (1814), type loc. Mass. Var. californica Fer. Rhod. 24:23 (1922); Jepson, Man. 422 (1925). *C. californica* Hel. Muhl. 3:10 (1907), type loc. Monterey, *Heller* 6856. *C. americana* Jepson, Fl. W. Mid. Cal. 216 (1901), ed. 2, 183 (1911).

8. RAPHANUS L. Radish

Coarse much-branched annuals or biennials. Lower leaves lyrately pinnate or pinnatifid, shortly petioled. Flowers large, purple or yellow, or becoming white. Petals long-clawed. Pod thick, beaked by the stout style, 1-celled, filled with spongy or corky tissue, lightly constricted between the seeds or even moniliform, indehiscent or eventually breaking transversely into 1-seeded joints. Seeds subglobose, cotyledons conduplicate.—Species about 6, Europe and Asia. (Greek raphanos, quick-appearing, on account of the prompt germination of the seeds.)

1. **R. sativus** L. Wild Radish. Branching widely, 2 to 5 feet high; herbage nearly glabrous or hispid with scattered hairs; blades of lower leaves pinnately parted, crenate, the terminal segment large and round, the lateral smaller, ovate or oblong, sessile with the upper side adherent to the midrib, the lower lobe free; blades of upper leaves mostly toothed, or with a few small lateral segments; flowers 8 to 9 lines broad; petals purple or white; pods 3 to 4 lines broad, 1 to 3 inches long, with one to several constrictions, 2 to 3-seeded, or the body of the pod globose and 1-seeded.

Common weed of waste places in towns and villages and about country settlements. Naturalized from Europe. May-Aug.

Locs.—Chico, *Heller* 11,560; Vacaville, *Jepson* 5k; Berkeley, *Jepson* 126c; French Camp, San Joaquin Co., *Sanford;* Pacific Grove, *Parish* 11,570; Santa Ana, *Alice King;* Escondido, *C. V. Meyer* 122; Witch Creek, *Alderson.*

Refs.—Raphanus sativus L. Sp. Pl. 669 (1753), type European; Parish, Muhl. 5:126 (1909); Jepson, Fl. W. Mid. Cal. 217 (1901), ed. 2, 185 (1911), Man. 422 (1925).

R. raphanistrum L. Sp. Pl. 669 (1753), type European; Jepson, Fl. W. Mid. Cal. 218 (1901), ed. 2, 185 (1911); Man. 422 (1925). Jointed Charlock. Flowers yellow or white; pod moniliform, (1 or) 4 to 10-seeded.—Native of Europe, occasionally adventive: San Diego; San Jacinto Valley; San Bernardino (Muhl. 5:126); Pacific Grove; San Francisco; Berkeley; Elk Grove; Yosemite.

9. BRASSICA L. Mustard

Ours annuals or biennials, either glabrous or sparsely hispid with coarse hairs, the lower leaves usually lyrately pinnatifid or pinnate, the upper disposed to be more or less entire. Flowers large, yellow. Lateral sepals more or less gibbous at base. Petals with long claw and abruptly spreading limb. Papilla-like glands 4, green, rather large, alternating with the claws of the petals. Pod terete, terminating in a stout beak; valves 1 to several-nerved. Seeds in 1 row, globose. Cotyledons conduplicate, incumbent.—Species about 80, eastern hemisphere. All of our species are naturalized weeds. (The Latin name for cabbage.)

Bibliog.—Lambert, A. B., Note on the Mustard plant of the Scriptures (Trans. Linn. Soc. 17:449–450,—1837). Pieters, A. J., and Charles, Vera K., Seed coats of certain species of the genus Brassica (U. S. Dept. Agr., Division of Botany Bull. 29:1–19, figs. 1–6,—1901).

Pods ascending on spreading pedicels; annual.
  Stem-leaves with the blades auriculate or cordate-clasping; beak terete........1. *B. campestris.*
  Stem-leaves with the blades petioled or merely sessile; beak flattish..................2. *B. arvensis.*
Pods closely appressed to the stem.
  Stems glabrous or nearly so; pods somewhat quadrangular, the beak short; annual................ 3. *B. nigra.*
  Stems retrorse-hispidulose; pods terete, the beak 2/5 as long as the body, commonly containing a seed; perennial..........4. *B. incana.*

1. **B. campestris** L. Common Yellow Mustard. Turnip. Rutabaga. Erect, sparingly branched, 1 to 6 feet high; herbage succulent, glaucous, and glabrous save for some bristle-bearing pustules on the upper surface of the lower leaves; blades of cauline leaves all sessile and clasping by an auricled base; blades of the lower leaves irregularly serrate or denticulate, and pinnatifid or pinnate with the terminal segment very large and the lateral segments sessile by a broad base and more or less decurrent on the rachis, the blades of the upper ones lanceolate and entire; flowers 6 to 8 lines broad; sepals narrowly oblong, yellowish, ascending; petals with elliptic limb; pods terete, 1¼ to 1½ inches long, narrowed into a subulate beak, tipped with a flat stigma.

Naturalized European weed, abundant throughout California. Feb.-Apr.

Locs.—Eureka, *Tracy* 3242; Truckee, *Sonne;* Berkeley, *Jepson* 126f; Elmira, *Jepson;* Rubio Cañon (hills w.), San Gabriel Mts., *Peirson* 306; Escondido, *C. V. Meyer* 9.

Refs.—BRASSICA CAMPESTRIS L. Sp. Pl. 666 (1753), type European; Jepson, Fl. W. Mid. Cal. 216 (1901), ed. 2, 184 (1911), Man. 423 (1925).

2. **B. arvensis** Rabenh. CHARLOCK. Stem branching, 1 to 2 feet high; herbage light green, hispid with scattered hairs or merely hispidulose; leaf-blades pinnatifid or lobed or merely toothed, the upper rhombic, petioled or sessile by a narrow base, not clasping; petals 4 to 6 lines long; pods somewhat constricted between the seeds, 1 to 1½ inches long, with 3 to 8 seeds in each cell; beak flattish, ⅓ as long as the body, often containing a seed; valves nerved.

Native of Europe, sparingly naturalized. Apr.

Locs.—Yreka; Eureka, *Tracy* 4635; Napa, *Jepson* 59e; Vacaville, *Jepson* 5301; Berkeley, *Jepson* 80g; San Francisco, *Elsie Zeile;* Alviso, *Jepson* 15,187.

Refs.—BRASSICA ARVENSIS Rabenh. Fl. Lusatica 1:184 (1839); B.S.P. Prel. Cat. N. Y. 5 (1888); Jepson, Fl. W. Mid. Cal. 217 (1901), ed. 2, 184 (1911), Man. 423 (1925). *Sinapis arvensis* L. Sp. Pl. 668 (1753), type European. *B. sinapistrum* Boiss. Voy. Espag. 2:39 (1839–45); B. & W. Bot. Cal. 1:40 (1876).

3. **B. nigra** Koch. BLACK MUSTARD. Stems 3 to 6 or even 12 feet high; herbage dark green (not glaucous), glabrous or with some scattered stiff hairs; leaves all petiolate; blades of the lower leaves lyrately pinnatifid or divided, the terminal segment very large, shallowly lobed and sharply dentate; blades of the upper leaves less lobed or the uppermost linear and entire and commonly drooping or pendulous; racemes long and dense; petals 3½ lines long, much longer than the sepals; pods closely appressed to the axis of the raceme, torulose, indistinctly 4-sided, beaked by the style; seeds nearly black, highly pungent.

Naturalized from Europe, everywhere common at low altitudes though rare in the deserts. Very abundant in interior grainfields. May-July.

Historical note.—In pioneer days Brassica nigra was generally of ranker growth than at present, forming thickets 8 to 12 feet high, which became, except for the cattle paths, as impenetrable as brushwood. In the early eighties of the last century such thickets existed for many leagues all about the settlement of mainly adobe houses known as Los Angeles. Children were warned not to wander into the Black Mustard "groves," since they frequently became lost (H. A. Dutton). Birds nested in the branches of these "trees" and, eating the seeds, disseminated widely the mustard pest.

According to A. B. Lambert (Trans. Linn. Soc. Lond. 17:449,—1837), this is the Mustard Tree of the Bible (Matt. 13:31–32). In any event Brassica nigra is indigenous throughout the Mediterranean region. From the Mediterranean, probably from Spain by way of Mexico, it was, with scarcely any doubt, introduced into California during the Franciscan Mission period. Folk legends have come down which picture the friars dropping the seed at intervals on the flats and in the passes, while threading the unknown coastal valleys as they penetrated northward towards the later San Francisco, in order that the expedition might, by the growing plants, easily find its way back again over the same route the next year. On the other hand printed records which use the scientific binomial in the designation of the species as occurring in Alta California during the Spanish period and early American period are very scarce, perhaps indeed quite lacking. No Brassica species is mentioned for California in Bentham's Botany of the Voyage of the Sulphur, Hooker and Arnott's Botany of Beechey's Voyage, Hooker's Flora Boreali-Americana, Presl's Reliquiae Haenkeanae nor in the Linnaea papers of Chamisso and Schlechtendahl. Even in the highly interesting botanical parts of the Pacific Railroad Survey Reports, with the Survey's list of plants as collected by the various expeditions, there is no mention of Brassica in California. It is somewhat difficult to reconcile this lack of scientific record with the popular theory of the very early introduction of Brassica nigra except upon the ground that the botanists of the first expeditions were naturally absorbed in collecting the striking novelties of the California flora. Doubtless so common an alien as Brassica nigra, well known in other parts of the world, was disregarded by scientific travelers as unworthy of their attention, as not meriting collection or record. That the printed record is, in this matter, deficient, is evidenced by the testimony of the early settlers. These American pioneers in California have, by way of reminiscence, related seeing the Black Mustard in gold days. One of them, James McCrory, tells us of this species filling with yellow the Santa Clara Valley and other valleys bordering San Francisco Bay during the fifties of the last century. There was comparatively little cultivation of the soil in the earliest days of the American occupation and the Black Mustard spread freely over the moist valley lowlands. Notwithstanding that the plant was so common in the fifties and sixties, printed botanical records, as said, are lacking. So far as now appears, the binomial Brassica nigra, in indication of this species as growing in California, first occurs in Bolander's "Catalogue of Plants Growing in the Vicinity of San Francisco," published in 1870, page 5.

Locs.—Hydesville, Humboldt Co., *Tracy* 4514; Ft. Bragg, *W. C. Mathews;* Napa, *Jepson;* Mt. Diablo, *Jepson* 9199; Berkeley; Berryessa, Santa Clara Co., *Davy* 7055; San Luis Obispo, *Brewer* 484; Mission La Purisima, *Jepson* 11,931; Santa Barbara; Strawberry Valley, San Jacinto Mts.; Escondido, *C. V. Meyer* 21.

Refs.—Brassica nigra Koch.; Roehl. Deutschl. Fl. ed. 3, 4:713 (1833); Jepson, Fl. W. Mid. Cal. 217 (1901), ed. 2, 184 (1911), Man. 423 (1925). *Sinapis nigra* L. Sp. Pl. 668 (1753), type north European.

4. **B. incana** Meigen. Stem widely branching, 1½ to 3 feet high; herbage hispidulose, retrorsely so on the stems and petioles; leaf-blades pinnately parted, or the uppermost merely lobed or subentire; flowering racemes subcapitate, much elongated in fruit; petals 2 to 3 lines long; pods closely appressed to the axis, 5 to 7 lines long, the beak ⅖ to ½ as long as the body, constricted beyond the valves and bearing a single seed in the constricted portion.

Introduced from Europe; established along the coast and spreading into the interior. May-Sept.

Immigrant note.—Brassica incana (*B. adpressa* Boiss.) first appeared in Los Angeles about 1909 (Davidson, Bull. S. Cal. Acad. 12:11,—1913). As early as 1895 it is indicated (Syn. Fl. 1^1:134) as collected at San Bernardino by Parish and it was again (1914) noted by Parish in San Bernardino and later (1918) in Redlands; cf. Bull. S. Cal. Acad. 19^4:17 (1920). In the San Francisco Bay region it was first noted in Berkeley about 1915 but probably appeared earlier. It has since spread rapidly throughout this region and has become common: St. Helena, *Jepson* 9831; Brannan Isl., lower Sacramento River, *Jepson* 10,220; Oakdale, *Jepson* 10,569.

The two long-established grainfield weeds, B. nigra and B. campestris, keep mainly to broken ground, and in great part, complete their cycle during the winter and spring seasons. B. incana, on the contrary, spreads freely over dry unbroken ground and flourishes chiefly during the arid summer season. Of these three the latter is evidently destined to be the more abundant species and is already a serious agricultural pest.

Refs.—Brassica incana Meigen, Deutschl. Fl. 3:270 (1842). *Sinapis incana* L. Cent. Pl. 1:19 (1755). *B. adpressa* Boiss. Voy. Espag. 2:38 (1839–45), type loc. Spain; Jepson, Man. 423 (1925). *Hirschfeldia incana* Lagreze-Fossat, Fl. Tarn et Garonne 19 (1847).

B. eruca L. Sp. Pl. 667 (1753), type loc. Switzerland. Garden Rocket. Somewhat succulent, 1 to 1½ feet high; herbage glabrous or sparingly hirsute; leaf-blades lyrate, pinnately lobed or pinnatifid; flowers ½ to ¾ inch broad, variously colored, the petals strongly veined; pods erect-appressed, ¾ inch long, the stout flat beak ⅓ as long as the body.—Adventive from Europe: fields near Yreka, *Butler* 1050; newly seeded alfalfa field, San Luis Obispo, *Condit* in 1909; vacant lot, San Bernardino, in 1923 (Bull. S. Cal. Acad. 23:129).

B. alba Boiss. Voy. Espag. 2:39 (1839–45). *Sinapis alba* L. Sp. Pl. 668 (1753), type European. White Mustard. Erect annual 1 to 2 feet high, more or less pubescent with stiff hairs; leaf-blades all pinnatifid with large terminal leaflet or lobe, bluntly toothed; pods on spreading pedicels, bristly, the broad sword-shaped beak equaling or longer than the body; seeds few, large, pale.—Native of Europe, adventive in orchards or grainfields: Riverside, *Richard Raynor;* Santa Monica (Erythea 1:57); Surf, Santa Barbara Co., *K. Brandegee;* Byron, *Bioletti;* vicinity of San Francisco (Bolander, Cat. 5,—1870); Vacaville, *Jepson* 527.

10. DIPLOTAXIS DC.

Herbs similar to Brassica. Leaves toothed, pinnatifid, pinnately divided or entire. Petals yellow. Nectar glands 4, minute. Pods linear-elongated, flat or flattish, short-beaked, borne erect on straight obliquely ascending pedicels; valves mostly 1-nerved; seeds in 2 rows in each cell; cotyledons conduplicate.—Species 19, central Europe to north Africa and India. (Greek diploos, double, and taxis, arrangement, referring to the biseriate seeds.)

1. **D. tenuifolia** DC. Wall Rocket. Perennial; stems erect, leafy, 1 to 4½ feet high; petals 3½ to 6 lines long; pods 1 to 1¼ inches long.

Native of Europe, sparingly naturalized in coastal Southern California. Apr.

Locs.—Pasadena, *Geo. B. Grant* 289, at least as early as 1905; Los Angeles, *Davidson* in 1895; "scattered over about 200 acres between Santa Ana and Tustin, introduced about ten years since," *Ethelbert Johnson* in 1929.

Refs.—DIPLOTAXIS TENUIFOLIA DC. Syst. 2:632 (1821); Jepson, Man. 423 (1925). *Sisymbrium tenuifolium* L. Cent. Pl. 18 (1755), "Gallia, Italia, Helvetia."

DIPLOTAXIS MURALIS DC. Syst. 2:634 (1821). Sand Rocket. Annual: leaves mostly basal; petals 2 to 2½ lines long; pods 1 to 1⅓ inches long.—Native of Europe, adventive at San Bernardino acc. Parish (Bull. S. Cal. Acad. 19^4:18,—1920).

Conringia orientalis Dumort. Fl. Belg. 123 (1827). *Brassica orientalis* L. Sp. Pl. 666 (1753), "in Oriente", i.e., Near East. HARE'S EAR. *Erysimum perfoliatum* Crantz, Stirp. Aust. 1:27 (1762). Erect glabrous annual; leaves elliptic to ovate, cordate-clasping, entire; petals yellowish; pods erect, linear, elongated.—Introduced from the east Mediterranean region, a waif in waste places: Upland, San Bernardino Valley (Bull. S. Cal. Acad. 19^4:18,—1920).

11. BARBAREA R. Br.

Perennial herbs similar to the yellow-flowered Nasturtiums. Stem angular. Leaves lyrate or pinnatifid. Flowers yellow. Stamens 6, distinctly tetradynamous. Pod linear, somewhat quadrangular, abruptly tipped by a short style, the valves strongly 1-nerved or carinate. Seeds in 1 row in each cell, turgid, not margined.—About 7 species, temperate zones. (Named after St. Barbara.)

1. **B. orthoceras** Ledeb. WINTER CRESS. Stem erect, rather stout, 10 to 16 inches high; herbage glabrous; blades of basal leaves elliptic, sometimes cordate at base, ¾ to 2 inches long, with or without small supplementary lobes borne along the petiole; blades of cauline leaves similar, pinnatifid, with the terminal lobe largest and often oblong-lanceolate; raceme terminal and solitary or with several from the upper axils; petals narrowly obovate or oblanceolate, the blade scarcely narrowed into a claw, about 3 lines long, twice or nearly twice as long as the yellow sepals; pods somewhat crowded, erect and appressed or strongly ascending, ¾ to 1 inch long, ¾ line wide, the beak ¼ to ½ line long.

Along streams or in woods in the high mountains, 9500 to 12,000 feet: Sierra Nevada from Tulare Co. to Fresno Co. North to Alaska, thence east to Labrador; n. Asia; n. Scandinavia (acc. Fernald). July.

Geog. note.—While mainly or wholly absent from the deserts and the valleys, Barbarea orthoceras (including its variety) is in California widely distributed in the mountain ranges and the foothills, not only in the Coast Ranges but in the most primitive and unchanged portions of the Sierra Nevada at middle and high altitudes. It is, judged by the nature of the habitat and the associated indigenous species, very certainly, we think, a native plant. We may add that it is also found on the highest and most remote peaks in an alpine form, as on Mt. Whitney, where its decumbent stems, 2 to 4 inches long, bear flowers with the sepals slightly thickened at apex. The typical form of the species is apparently somewhat uncommon in California and is confined to the high Sierra Nevada; in almost all of our specimens the racemes are more or less pathogenic.

Locs.—Poison Mdw., Soda Cañon, Sawtooth Range, *Jepson* 1137; Wildflower Lake, w. Inyo Co., *Jepson* 884; Kearsarge Pass, *Jepson* 881; Huntington Lake, *A. L. Grant* 1477; Soda Sprs., San Joaquin River, *Congdon.*

Var. **dolichocarpa** Fer. Siliques spreading or ascending, somewhat remote, often somewhat incurved, 1¼ inches long, ½ line wide.—Wet ground, about springs or in woods, foothills and mountains, 300 to 9500 feet: coastal Southern California; Sierra Nevada; Coast Ranges. North to British Columbia, east to Wyoming, south to Mexico (acc. Fernald, Rhod. 11:140). Mar.-July.

Locs.—S. Cal.: Big Pines, San Gabriel Mts., *Peirson* 3166; Seeleys Flat, San Bernardino Mts., *Parish.* Sierra Nevada: Volcano Creek, Tulare Co., *Jepson* 4946; Crane Flat, Yosemite Park, *Jepson* 10,437; Calaveras Big Trees, *A. L. Grant;* Mineral, Tehama Co., *J. Grinnell.* Coast Ranges: Berkeley, *Jepson* 6227; Mt. Tamalpais, *Jepson* 11,561; Howell Mt., *Jepson* 10,319, 13,344.

Refs.—BARBAREA ORTHOCERAS Ledeb. Hort. Dorp. (1824), Fl. Ross. 1:114 (1841), type loc. Siberia. *B. vulgaris* Greene, Fl. Fr. 249 (1891); Jepson, Fl. W. Mid. Cal. 220 (1901), ed. 2, 187 (1911), Man. 424 (1925). Var. DOLICHOCARPA Fer. Rhod. 11:140 (1909), type loc. w. Klickitat Co., Wash., *Suksdorf* 2022. *B. vulgaris* var. *arcuata* B. & W. Bot. Cal. 1:40 (1876).

12. RADICULA Hill

Nearly or quite glabrous herbs, sometimes growing in water, mostly in wet places. Leaves toothed or pinnatifid or pinnately divided. Flowers small, white or yellow. Sepals spreading in anthesis. Petals scarcely clawed. Stigma capitate, nearly sessile. Pod linear or oblong, terete or nearly so, valves mostly 1-nerved. Seeds minute, in 2 rows in each cell; cotyledons accumbent.—About 50 species, all continents but most abundant in the north temperate zone. (Diminutive of Latin radix, radish.)

Flowers white; petals distinctly clawed, nearly twice the length of the sepals; perennial................ 1. *R. nasturtium-aquaticum.*
Flowers yellow; petals scarcely clawed, shorter or little longer than the sepals.
  Pods linear, more or less curved upward; annual or biennial.
    Stems several from the base, diffuse; leaves pinnately parted or divided, the lobes mostly regular and equal..2. *R. curvisiliqua.*
    Stem one, erect, branching above the base; leaves lyrately pinnatifid..........3. *R. palustris.*
  Pods oblong, turgid, straight; low diffuse plants; perennial..................................4. *R. sinuata.*

1. **R. nasturtium-aquaticum** Britten & Rendle. WATER CRESS. Stems ascending or prostrate at base and rooting at the nodes; herbage glabrous; leaflets or segments 3 to 9, ovate or nearly round, the terminal always the largest, or the lowest leaves without lateral leaflets; flowers white, 2 to 2½ lines broad; petals nearly twice the length of the sepals; pods divaricately spreading, ½ to 1 inch long, the pedicels ⅔ to as long.

Abundant in slow-flowing creeks (especially where not bordered by trees) and about springs in the mountains, 1 to 6000 feet: throughout California. Europe. May-Aug.

Immigration note.—While this plant has long been thought an introduced plant, it seems not to be such in the most usual sense, that of involuntary introduction through modern trade and traffic. There is developing a considerable body of evidence that Water Cress was present in North America and in California before the advent of the historical settlements by Europeans. This subject is well discussed by S. B. Parish in the Bulletin of the Southern California Academy of Sciences (19^4:18,—1920).

Locs.—Yreka, *Butler* 1056; Kneeland Prairie, Humboldt Co., *Tracy* 3830; Ulatis Creek, nw. Solano Co., *Jepson* 13,401; Berkeley, *Jepson;* Dorrington, Calaveras Co., *Jepson;* Monterey coast, *Jepson;* Cajon Pass, *Peirson* 372; Santa Ana, *Alice King.*

Refs.—RADICULA NASTURTIUM-AQUATICUM Britt. & Rendle, Brit. Seed Pl. 3:1907; Jepson, Man. 424 (1925). *Sisymbrium nasturtium-aquaticum* L. Sp. Pl. 657 (1753), type European; Britt. & Br. Ill. Fl. ed. 2, 2:162, fig. 2033 (1913). *Nasturtium officinale* R. Br.; Ait. Hort. Kew. ed. 2, 4:110 (1812); B. & W. Bot. Cal. 1:43 (1876); Jepson, Fl. W. Mid. Cal. 221 (1901), ed. 2, 187 (1911). *Roripa nasturtium* Rusby, Mem. Torr. Club 3^3:5 (1893).

2. **R. curvisiliqua** Greene. WESTERN YELLOW CRESS. Stems several to many from the base, diffuse (rarely erect), 3 to 7 inches long (rarely to 1 or 1½ feet long); herbage glabrous; leaves mostly ¾ to 2 inches long, or the lowest or basal often 3 to 12 inches long, their blades pinnatifid or pinnately parted (the segments varying from linear and commonly entire to oblong or ovate and either entire, toothed or pinnatifid); pods linear, terete, more or less curved, 2½ to 7 lines long, the pedicels ½ to 1½ lines long.

Frequent in stream beds, margins of pools and marshy places, 10 to 7500 feet: throughout California. North to British Columbia, east to Wyoming, south to Lower California. Exceedingly variable in foliage. May-July.

Locs.—Sierra Nevada: Hume Lake, Fresno Co., *H. P. Kelley;* Hetch Hetchy, *A. L. Grant* 854; Belle Mdw., Tuolumne Co., *Jepson* 6488; Dorrington, Calaveras Co., *Jepson* 10,174; Blue Cañon, Placer Co., *H. A. Walker* 1208; Truckee, *Sonne;* Prattville, Plumas Co., *Cleveland;* Goose Lake Valley, Modoc Co., *R. M. Austin;* Little Hot Springs Valley, Modoc Co., *M. S. Baker;* Stillwater, Shasta Co., *M. S. Baker;* Medicine Lake, Siskiyou Co., *M. S. Baker.* Great Valley: Yuba

City, *Jepson;* Princeton, Colusa Co., *Chandler;* Vacaville, *Jepson* 13,382; Stockton, *Davy.* Coast Ranges: Oro Fino, *Butler* 121; Yreka, *Butler* 118; Marble Mt. valley, *Butler* 131; Eureka, *Tracy* 2519; Holmes Flat, Eel River, *Tracy* 4693; Fort Bragg, *W. C. Mathews* 85; Soldier Ridge, se. Trinity Co., *Jepson* 13,380; Uncle Sam Mt., Lake Co., *Jepson;* Gilroy, *Jepson* 13,378; Carmel River, *Jepson* 13,379; San Miguelito Rancho, Santa Lucia Mts., *Jepson* 1638; Arroyo Grande, San Luis Obispo Co., *Alice King.* S. Cal.: Bluff Lake, San Bernardino Mts., *Nora Pettibone;* Hemet Valley, Riverside Co., *C. M. Wilder* 943; Ft. Yuma, *Parish* 8295.

Refs.—RADICULA CURVISILIQUA Greene, Lflts. 1:113 (1905); Jepson, Man. 424, fig. 415 (1925). *Sisymbrium curvisiliqua* Hook. Fl. Bor. Am. 1:61 (1830), type loc. North-West Coast, in sandy soil, near streams, *Douglas. Nasturtium curvisiliqua* Nutt.; T. & G. Fl. 1:73 (1838), Columbia River, *Nuttall;* Jepson, Fl. W. Mid. Cal. 221 (1901), ed. 2, 188 (1911); B. & W. Bot. Cal. 1:42 (1876); Gray, Syn. Fl. 1^1:148 (1895). *Roripa curvisiliqua* Bessey, Mem. Torr. Club 5:169 (1894). *Nasturtium curvisiliqua* var. *lyratum* Wats.; Brew. & Wats. l.c. 43. *Roripa lyrata* Greene, Man. Reg. S. F. Bay 20 (1894). *Radicula lyrata* Greene, Lflts. l.c.

3. **R. palustris** Moench. MARSH CRESS. Stem erect, simple or mostly branched above, (1 or) 2 to 5 feet high; herbage usually glabrous; leaf-blades broadly oblanceolate or narrowly oblong in outline, coarsely toothed or, if deeply pinnatifid, mostly on the lower part of the blade, the lobes often irregularly dentate; pods oblong, turgid, 2½ to 5½ lines long, obtuse, the pedicels nearly as long; style ¼ to ½ line long.

Marshy places near streams, 50 to 6200 feet: widely distributed in California, but not common. North to British Columbia; east to the Atlantic. Europe, Asia. Mar.-June.

Locs.—Garden Grove, Orange Co., *Alice King;* Kern River delta, *Davy* 2151; Bakersfield, *Heller* 7595; Selma, *Kate Stirring;* Searsville, San Mateo Co., *C. F. Baker* 1856; Tracy, *Michener & Bioletti;* Lathrop, *H. A. Walker;* St. Helena, *Jepson* 13,375; Truckee River at Tahoe, *Helen Geis* 198; Grouse Creek, Humboldt Co., *Chesnut & Drew;* Yuba City, *Jepson* 13,377; Star Bend, Feather River, *Jepson* 13,376; Biggs, *Jepson* 12,356; Redding, *Blankinship.*

Refs.—RADICULA PALUSTRIS Moench, Meth. 263 (1794); Britt. & Br. Ill. Fl. ed. 2, 2:161, fig. 2030 (1913); Greene, Fl. Fr. 268 (1891); Jepson, Man. 425 (1925). *Sisymbrium amphibium a palustre* L. Sp. Pl. 657 (1753), type from n. Eur. *Nasturtium terrestre* R. Br.; Ait. Hort. Kew. 2, 4:110 (1812); Gray, Syn. Fl. 1^1:147 (1895). *N. palustre* DC. Syst. 2:191 (1891); Greene, Fl. Fr. 268 (1891); Jepson, Fl. W. Mid. Cal. 221 (1901), ed. 2, 188 (1911). *Roripa palustris* Besser; Greene, Man. Reg. S. F. Bay 20 (1894). *Nasturtium dictyotum* Greene, Fl. Fr. 268 (1891), type loc. Grand Isl., lower Sacramento River, *Jepson* (a teratological form). *Roripa dictyota* Greene, Man. Reg. S. F. Bay 20 (1894). *Radicula dictyota* Greene, Lflts. 1:113 (1905). *Nasturtium occidentale* Greene, Fl. Fr. 268 (1891), type loc. plains of the upper Sacramento. *Radicula occidentalis* Greene, Lflts. l.c. *Roripa multicaulis* Greene, Pitt. 3:97 (1896), type loc. banks San Joaquin River.

4. **R. sinuata** Greene. SAND CRESS. Stems decumbent or prostrate, arising from deep-seated vertical rootstocks, branching, pale green, puberulent, 4 to 6 inches long; herbage pale green, the stems puberulent; leaf-blades more or less narrowly oblong or oblanceolate, pinnately parted in a sinuate and regular manner, the segments rather crowded, subequal, oblong to deltoid, entire or coarsely toothed; petals yellow, scarcely longer than the sepals, aging white and half again as long; pods ovate to oblong, very turgid with rounded valves (almost obcompressed), rounded at apex or pointed, 1½ to 2½ lines long, on pedicels 1½ to 2 lines long; style usually ½ to ¾ line long.

Montane, often in the deep sand of lake or river shores, 5000 to 6200 feet: San Bernardino Mts.; Sierra Nevada. North to Saskatchewan, east to Arkansas. July.

Locs.—Pods rounded or truncate at apex: Little Bear Valley, San Bernardino Mts.; State Line, Lake Tahoe, *Peirson* 6187; Emerald Bay, *J. T. Howell* 1376; Lakeside, Eldorado Co., *Helen Geis* 153. Pods pointed at apex: upper San Joaquin River, Madera Co., *Congdon;* Cedarville Cañon, Modoc Co., *R. M. Austin.*

Var. **truncata** Jepson. Habit and leaves similar to the species; pods oblong, 1½ to 1¾ lines long, truncate, the style very short.—San Gabriel Mts. (Crystal Lake).

Var. **integra** Jepson. Leaf-blades narrowly obovate to broadly oblong, not lobed, sparingly dentate or subentire; pods oblong-ovate, turgid, 1½ to 2 lines long, on pedicels ¾ line long.—Montane, 6000 to 10,200 feet, east of the Sierra Nevada from Inyo Co. to Modoc Co.

Locs.—Silver Cañon near Big Prospector Mdw., White Mts., *Jepson* 7354; North Fork Crooked Creek, White Mts., *Jepson* 7344; Mt. Bidwell, *Jepson* 7902.

Refs.—RADICULA SINUATA Greene, Lflts. 1:113 (1905); Jepson, Man. 424 (1925); Britt. & Br. Ill. Fl. ed. 2, 2:160, fig. 2027 (1913). *Nasturtium sinuatum* Nutt.; T. & G. Fl. 1:73 (1838), type loc. banks of the Columbia River, *Nuttall;* B. & W. Bot. Cal. 1:43 (1876); Gray, Syn. Fl. 1^1:147 (1895). *Roripa sinuata* Hitchcock, Spring Fl. Manhat. 18 (1894). *Roripa tenerrima* Greene, Erythea 3:46 (1895), type loc. Modoc Co., *R. M. Austin*. *Radicula tenerrima* Greene, Lflts. 1:113 (1905). Var. TRUNCATA Jepson, Man. 424 (1925), type loc. Crystal Lake, San Gabriel Mts., *Peirson* 2450. Var. INTEGRA Jepson, Man. 425 (1925), type loc. Silver Cañon, White Mts., *Jepson* 7354.

RADICULA AUSTRIACA Jepson comb. n. *Nasturtium austriacum* Crantz, Stirp. Austr. ed. 1: 15 (1762), type from Austria. *Roripa austriaca* Spach, Hist. Veg. Phan. 6:513 (1838); Hegi, Fl. Mit.-Eur. 4^1:309, fig. 803. Stems slender, erect, 1½ to 2 feet high, microscopically puberulent; blades of the leaves oblong to oblong-obovate, unequally serrate, narrowed below to a broad petiole-like auriculate base, 1¼ to 2½ inches long, glabrous; racemes 3 to 5 inches long, paniculate at summit; petals yellow, 2 lines long; pedicels soon spreading, 2 to 5 lines long; pods subglobose, ½ to 1½ lines long.—European weed, introduced into cultivated fields in Modoc Co.: Corporation ranch, south of Alturas, acc. M. K. Bellue (Mo. Bull. Cal. Dept. Agr. 22:385), reported in 1933. In general habit it recalls some Sisymbrium species.

13. CARDAMINE L. Bitter Cress

Ours erect herbs with leafy stems. Leaves simple or pinnate, the basal in a rosette. Flowers white or pinkish. Very near Dentaria and scarcely separable, but the flowers smaller (in ours 1 to 4 lines long) and pods narrower.—About 125 species, temperate regions of both hemispheres and extending into the arctic zone. (Ancient Greek name of some species of cress.)

- Leaves simple, undivided; petals 2 to 3 lines long; perennials; ne. Cal.
  - Stems many from an ascending much-branched caudex; flowers white or pinkish; dwarf plants........1. *C. bellidifolia.*
  - Stem simple or branched above, from a running rootstock; flowers white; plants 1 to 2 feet high........2. *C. lyallii.*
- Leaves, at least the cauline, with 3 to many pinnate leaflets; flowers white.
  - Some basal leaves simple; cauline 3 to 5-foliolate; petals 2½ lines long; perennial; mostly montane........3. *C. breweri.*
  - Basal leaves pinnate.
    - Flowers rather large; petals 2½ to 3 lines long; perennial.
      - Leaflets 1 or 2 pairs, angulately lobed; plants abundantly stoloniferous; Humboldt Co........4. *C. angulata.*
      - Leaflets 4 to 6 pairs, not lobed; plants not stoloniferous; coastal S. Cal........5. *C. gambelii.*
    - Flowers smaller; petals 1 to 2 lines long; annuals or biennials.
      - Leaflets mostly roundish; capsules ½ to ⅔ line wide, about 8 to 18-seeded........6. *C. oligosperma.*
      - Leaflets mostly oblong or linear; capsules ⅓ line wide, about 20 to 30-seeded........7. *C. pennsylvanica.*

1. **C. bellidifolia** L. Alpine Cress. Scape-like peduncles and leaves caespitose on the branched root-crown, the plants 2 to 6 inches high; herbage glabrous; leaf-blades ovate or elliptic, 3 to 9 lines long, on slender petioles 2 to 3 times as long; flowers few; pods erect, 10 to 15 lines long.

High peaks of northern California, 7000 to 8000 feet: Lassen Peak; Mt. Shasta; Medicine Lake. North to Alaska, east to New England. Europe, Asia. June.

Locs.—Lassen Peak, *R. M. Austin;* Mt. Shasta (Syn. Fl. 1^1:155); Medicine Lake, *M. S. Baker* 508.

Refs.—CARDAMINE BELLIDIFOLIA L. Sp. Pl. 654 (1753), type European; Jepson, Man. 425 (1928). *C. bellidifolia* var. *pachyphylla* Cov. N. Am. Fauna 16:146 (1899), type loc. Mt. Shasta, *Merriam.*

2. **C. lyallii** Wats. Stem erect from a rootstock, simple or branched, 10 to 15 inches high; herbage glabrous; leaf-blades all simple, 6 to 8, reniform to cordate,

subentire or shallowly sinuate, 1 to 2¾ inches broad; pods erect on spreading pedicels ¾ to 1¼ inches long; style very short.

Montane, 5500 to 6000 feet: Placer Co. to Siskiyou Co. North to British Columbia, east to northern Nevada. June-July.

Locs.—Deer Park, Placer Co., *Helen Geis* 65; Truckee road to Hot Sprs., Tahoe, *Sonne;* w. slope Washoe Mts., Nevada Co., *Davy* 3162; Marble Mountain Valley, Siskiyou Co., *Butler* 132.

Refs.—Cardamine lyallii Wats. Proc. Am. Acad. 22:466 (1887), based on spms. from the Cascade Mts. of Ore. and Wash. (*Wilkes, Lyall, Hall* 29, *G. R. Vasey, Howell*), Blue Mts. of Ore. (*Cusick*) and Clover Mts. of Nev. (*Watson*); Jepson, Man. 425 (1925).

3. **C. breweri** Wats. Sierra Cress. (Fig. 133.) Stems from a slender rootstock, erect or decumbent at base, 7 to 16 inches high; herbage glabrous or nearly so; leaves 3 (or to 7)-foliolate, or the basal mostly simple; terminal leaflet usually round-cordate, entire to shallowly lobed; lateral leaflets usually very much smaller and rounded; pods 8 to 13 lines long, ½ to ⅔ line wide, ascending or erect on pedicels 4 to 7 lines long; style almost none.

Montane, 4000 to 8500 feet: Sierra Nevada from Tulare Co. to Modoc Co.; and near sea-level at Humboldt Bay. North to Washington, east to Wyoming. Apr.-July.

Locs.—Kern Lake, Kern Cañon, *Jepson* 4943; Wolverton Creek, Marble Fork Kaweah River, *Hopping* 348; North Fork Kings River; Soda Sprs., upper San Joaquin River, Madera Co., *Congdon;* Walker Lake, Mono Co., *Congdon;* Truckee River, Nevada Co., *Davy* 3163; Donner Lake, Nevada Co., *Heller* 6918; Yuba Pass, Sierra Co.; Bridge Creek, Lassen Co., *Baker & Nutting;* e. slope Mt. Shasta, *M. S. Baker;* Eureka, *Tracy* 4891.

Refs.—Cardamine breweri Wats. Proc. Am. Acad. 10:339 (1875), type loc. Sonora Pass, *Brewer;* Jepson, Man. 425 (1925). *C. modocensis* Greene, Pitt. 4:203 (1900), type loc. Lassen Creek, Modoc Co., *R. M. Austin.*

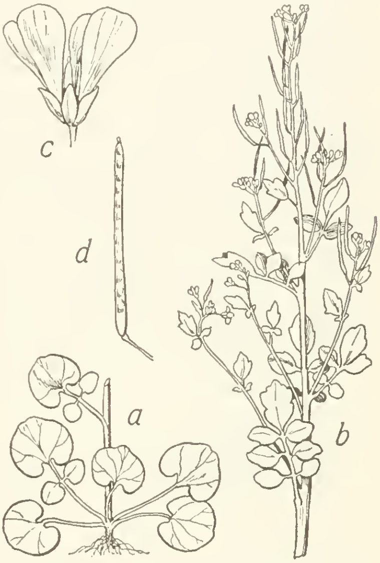

Fig. 133. Cardamine breweri Wats. *a*, base of plant, × ½; *b*, upper part of plant, × ½; *c*, fl., × 4; *d*, pod, × 1.

4. **C. angulata** Hook. Wood Cress. Stems erect, 1 to 1½ feet high, abundantly stoloniferous; herbage glabrous; leaves 3 or 5-foliolate, when 5-foliolate the lower pair of leaflets usually much smaller; leaflets ovate, 1 to 2¼ inches long, somewhat angulately 5-lobed, subpalmately and strongly 5-nerved; racemes 2 to 4½ inches long, rather few-flowered; pods lanceolate, straight, 9 to 11 lines long, spreading.

Wet places in Redwood forest, 400 to 600 feet: Humboldt Co. North to British Columbia. May.

Loc.—Prairie Creek, *Tracy* 7588. The lobes of the leaves are few, remote and angular; while variable they still give the foliage a peculiar aspect.

Refs.—Cardamine angulata Hook. Fl. Bor. Am. 1:44 (1829), type loc. Fort Vancouver, Columbia River, *Douglas, Scouler;* Bot. Misc. 1:343 t. 69 (1830).

5. **C. gambelii** Wats. Swamp Cress. Stems rather stout, 2 to 4 feet long, decumbent and rooting at base but not properly stoloniferous; herbage glabrous or sparingly soft-villous; leaflets 4 to 6 pairs, broadly ovate to narrowly oblong, cuneate at base, acute, 1 or 2-toothed on each side, 4 to 10 lines long; raceme very dense, becoming elongated and loose in fruit; flowers white, 2½ to 3 lines long; pods 9 to 10 lines long, mostly arcuate, on divaricate pedicels nearly as long; style slender, 1 line long.

Swamps, 1000 to 3000 feet: cismontane Southern California from Santa Barbara Co. to San Diego Co. South to Mexico.

Locs.—Los Angeles (Abrams, Fl. Los Angeles 172); San Bernardino, *Parish* 3796; Julian, San Diego Co.

Refs.—Cardamine gambelii Wats. Proc. Am. Acad. 11:147 (1876), type loc. near Santa Barbara, *Gambel, Rothrock;* Jepson, Man. 426 (1925).

6. **C. oligosperma** Nutt. Hill Cress. Stems branched from the base or simple, 3 to 14 inches high; herbage hispidulous or glabrous; leaves pinnate (the basal in a rosette), ½ to 1½ inches long (including the petiole); leaflets 5 to 11, little unequal, with a notch in each side toward the apex, 1 to 4 lines long, petiolulate; petals much surpassing the sepals; pods 6 to 9 (or 12) lines long; valves separating while still green-herbaceous; pedicels 1 to 2 lines long, little accrescent in fruit.

Under oaks and other trees in openly wooded country, 20 to 700 feet: Santa Monica Mts.; Coast Ranges from Monterey Co. to Humboldt Co.; Sierra foothills from Sacramento Co. to Shasta Co. North to British Columbia. Feb.-Mar.

Locs.—Topango Cañon, Los Angeles coast (acc. Parish, Bull. S. Cal. Acad. 8:7); Del Monte, *Berg;* Los Gatos; Alum Rock, Santa Clara Co., *Pendleton* 672; Berkeley, *Jepson* 13,357; Mill Valley, *Chandler;* Olema, *Jepson;* Santa Rosa, *M. S. Baker* 97; Duncan Mills, *Davy* 1643; Kelseyville, Lake Co., *Irwin* 23; Humboldt Bay, *Tracy* 4923; Redding, *Blankinship;* Burney Falls, Shasta Co., *M. S. Baker;* Michigan Bar, ne. Sacramento Co., *Jepson* 15,259.

Refs.—Cardamine oligosperma Nutt.; T. & G. Fl. 1:85 (1838), type loc. shady woods of the Columbia, *Nuttall;* Jepson, Fl. W. Mid. Cal. 222 (1901), ed. 2, 188 (1911), Man. 426 (1925).

7. **C. pennsylvanica** Muhl. Quaker Cress. Annual or biennial; stems simple or branched, 8 to 20 inches high; herbage glabrous or nearly so; leaflets 7 to 13, mostly oblong or linear, but those of the lowest leaves suborbicular, mostly sessile; pods suberect, on spreading pedicels 3 to 6 lines long.

Moist places, chiefly in shade, 3000 to 4000 feet: eastern Nevada Co. North to Alaska, east to the Atlantic. May.

Loc.—Truckee, *Sonne* 628.

Refs.—Cardamine pennsylvanica Muhl.; Willd. Sp. Pl. 3:486 (1800), type loc. Pennsylvania; Britt. & Br. Ill. Fl. 2:128, fig. 1726 (1897); Jepson, Man. 426 (1925).

14. DENTARIA L. Toothwort

Glabrous perennials. Stems and one or two long-petioled basal leaves from tuberous rootstocks, the stems usually with few leaves, rarely branched, and sparingly leafy. Flowers in a raceme, large, white or rose-tinted. Sepals equal at base, erect or nearly so. Petals with slender claws and ovate spreading limb, much longer than the sepals. Pod linear, flattened parallel to the partition, stout, attenuate above into the slender style, the valves and partitions not nerved; seeds wingless.—Species about 10, northern hemisphere. (Latin dens, a tooth, the rootstocks toothsome in some species.)

Leaves all simple; rare species.
  Cauline leaves scattered along the stem, their blades round-cordate; flowers in a raceme; foothills........1. *D. cardiophylla.*
  Cauline leaves approximate beneath the corymbose raceme, their blades suborbicular, obtuse at base; montane........2. *D. corymbosa.*
Cauline leaves pinnate or pinnately parted, the basal simple or 3 to 5-foliolate.
  Style 1 to 3 lines long; leaf-segments mostly ovate or roundish; common....3. *D. integrifolia.*
  Style 5 lines long; leaf-segments narrow; rare........4. *D. macrocarpa.*

1. **D. cardiophylla** Rob. Lad's Toothwort. Stem 6 to 11 inches high; leaf-blades cordate, denticulate, shortly acutish or obtuse, 1¼ to 2 inches wide; petioles 2 to 3 inches long, or of the cauline leaves 5 to 6 lines long; racemes subcorymbose; flowers 3½ lines long; corolla white.

Moist loam on wooded cañon slopes, 300 to 1000 feet: Vaca Mts., Solano Co. Mar.-Apr.

Loc.—In truly typical state this is known to us only from the east slope of the Vaca Mts., where first obtained Mar. 1, 1885.

Refs.—DENTARIA CARDIOPHYLLA Rob.; Gray, Syn. Fl. 1^1:155 (1895); Jepson, Fl. W. Mid. Cal. 222 (1901), ed. 2, 188 (1911). *Cardamine cardiophylla* Greene, Fl. Fr. 266 (1891), type loc. Weldon Cañon, Vaca Mts., *Jepson* 14,731. *D. integrifolia* var. *cardiophylla* Jepson, Man. 426 (1925).

2. **D. corymbosa** Jepson. WALTY TOOTHWORT. Plants 5 to 8 inches high; herbage glabrous; leaves all simple, the blades mostly orbicular in outline, coarsely dentate or sometimes palmately lobed, 1 to 1¾ inches long; cauline leaves mostly 2 or 3, approximate on upper part of stem; leaves from the rootstock with round-cordate blades; fruiting raceme corymbose, the lower pedicels 1 to 1¼ inches long; pods 1 to 1¾ inches long, not including the (2 to 3 lines long) style.

High peaks and mountain slopes, 5500 to 7000 feet: inner North Coast Ranges from the Yollo Bolly Mts. to northern Lake Co.; southern Sierra Nevada. Flowers unknown.

Locs.—North Coast Ranges: South Yollo Bolly; Black Butte, *C. M. Wilder;* Mt. Hull, Tulare Co.: Colony Mill, *W. Fry* 354.

Var. **grata** Jepson var. n. Stem simple, 4 to 6 inches high, naked below, the cauline leaves in threes (rarely in twos), somewhat approximate beneath the raceme; blades of cauline leaves ovate to oblong-lanceolate in outline, ¾ to 1¼ inches long, coarsely 3-toothed at apex, or sometimes with a supplementary lateral tooth near the middle on each side; leaves from the rootstock with blades obovate in outline, entire save for the 3-lobed apex; raceme in anthesis corymbiform, 7 to 10 lines long; flowers 3½ to 4½ lines long; petals white; fruit not known.—(Folia caulina ternata, raro binata, ovata vel oblongo-lanceolata, unc. ¾–1¼ longa, ad apicem crasse 3-denticulata, nunc cum dente addicio prope utriusque lateris medium; folia radicales obovata, integerrima, apice 3-lobato excepto.)—Timber Gap, Tulare Co., 9400 feet, *Hall & Babcock* 5370 (type).

Refs.—DENTARIA CORYMBOSA Jepson, Man. 426 (1925), type loc. South Yollo Bolly, *Jepson* 126d. Var. GRATA Jepson.

3. **D. integrifolia** Nutt. MILK-MAIDS. (Fig. 134.) Stem mostly one from the rootstock, erect, 6 to 21 inches high, the herbage rather fleshy; leaves from the rootstock simple or 3-foliolate, the blades of the leaves or leaflets orbicular, ovate or reniform, dentate or lobed, ½ to 2¾ inches long; cauline leaves 3 or 5-foliolate, the leaflets orbicular to lanceolate or linear; raceme mostly single; corolla white, 6 lines broad; sepals green or dull red; pods flattened, 1 to 1½ inches long, terminating in a stout style 1½ to 2 lines long.

Foothills and valley floors, 25 to 150 feet: Coast Ranges from Monterey Co. to Contra Costa, Sonoma and Napa Cos. Feb.-Apr.

Variation note.—Nuttall's original descriptions of his specimens of Dentaria integrifolia and californica (T. & G. Fl. 1:88) from Monterey differentiate his species very slightly and somewhat ambiguously. Chiefly on account of the word "plains", which we construe as *open places,* we are applying the name Dentaria integrifolia to the plant with thickish smallish leaves, entire leaflets, and white flowers, which grows in open wet situations on the valley floors, often whitening, in March and April, low moist fields from Monterey to Marin Co. and Napa Valley. This was evidently the construction placed upon the descriptions by E. L. Greene (Fl. Fr. 266). The following stations may be noted: San Francisco; West Berkeley; Lafayette, *Davy;* Dillon's Beach, *M. S. Baker;* Olema, *Jepson* 80e.

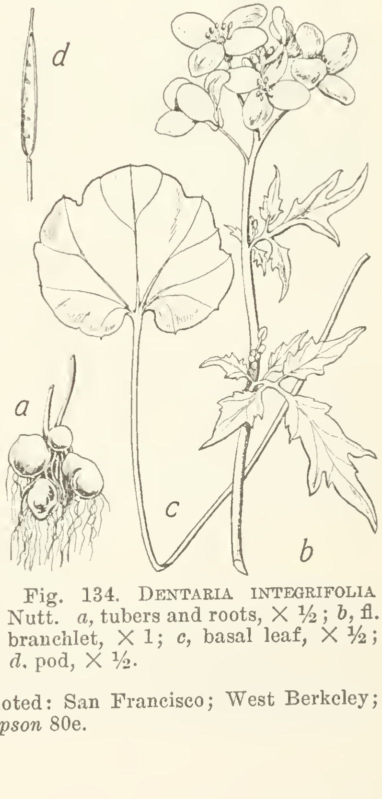

Fig. 134. DENTARIA INTEGRIFOLIA Nutt. *a,* tubers and roots, × ½; *b,* fl. branchlet, × 1; *c,* basal leaf, × ½; *d,* pod, × ½.

Dentaria integrifolia (including its varieties and more especially the var. californica) is extremely variable in foliage and in habit. Leaf or leaflet outline is especially fluctuating. A single individual often exhibits five or six distinct shapes of leaflets, while it is not infrequently one's experience that fifteen or twenty more or less marked leaf variants can be had from a series of plants from one station, the plants otherwise not dissimilar.

Var. **californica** Jepson. Leaves or leaflets larger and thinner, as a rule, than in the species; corolla white or pale rose-color.—Shady banks or in rich woods or thickets, 50 to 8700 feet, throughout cismontane California.

Geog. distribution.—This form, so nearly related to the species, grows in the wooded cañons of hills bordering the open wet valley flats indicated above as occupied by D. integrifolia but is more widely distributed by far and is common everywhere in the hill country beyond the range of D. integrifolia. Its leaves were described by Nuttall as crenate or incisely denticulate, and are in any event more commonly denticulate than in D. integrifolia, and are sometimes pale purple beneath. In the main its characters suggest that it is an edaphic variant. A long series of specimens of var. californica may be cited as follows. S. Cal.: San Diego, *G. W. Dunn;* Arroyo Seco, Los Angeles, *Braunton* 789; Pacoima Cañon, San Gabriel Mts., *Peirson* 265; Lady's Harbor, Santa Cruz Isl., *Mabel Peirson.* Coast Ranges: San Luis Obispo, *Ida Blochman;* Los Altos (hills back of), Santa Clara Co., *Jepson* 9103; Arroyo Mocho, *Jepson* 10,677; Mt. Diablo, *Jepson* 9850; Berkeley Hills, *Earl Mulliken* 4; Ross Valley, *Jepson* 30k; Papermill Creek, Marin Co., *Jepson* 10,311a; St. Helena, *Jepson* 32c; Knights Valley, *Jepson* 32d; Duncan Mills, *Davy* 1644; Navarro, Mendocino Co., *Byxbee;* Kneeland Prairie, *Tracy* 4878; Trinity Summit, *Davy* 5832; Marble Mt., *Jepson* 2844; Crescent City, *Howell.* Sierra Nevada: Tule River, Tulare Co., *Purpus* 5075; Yankee Hill, Tuolumne Co., *A. L. Grant* 650; New York Falls, Amador Co., *Hansen* 578; Big Mdws., Plumas Co., *R. M. Austin;* Little Chico Creek, *R. M. Austin* 332; Cow Creek Cañon, Shasta Co., *M. S. Baker;* Shasta Sprs., *Butler* 649.

Var. **tracyi** Jepson. Leaves a very dense deep purple beneath, the basal smaller than in var. californica; flowers deep rose-pink, slightly smaller.—Woods, Van Duzen River, Humboldt Co.

Var. **pachystigma** Wats. Raceme sessile or nearly so.—Plumas Co.

Refs.—DENTARIA INTEGRIFOLIA Nutt.; T. & G. Fl. 1:88 (1838), type loc. Monterey, *Nuttall;* Jepson, Fl. W. Mid. Cal. 221 (1901), ed. 2, 188 (1911); Man. 426 (1925). *Cardamine integrifolia* Greene, Bull. Cal. Acad. 2:389 (1887). Var. CALIFORNICA Jepson, Fl. W. Mid. Cal. 222 (1901), ed. 2, 188 (1911), Man. 426 (1925). *D. californica* Nutt. l.c., type loc. Monterey, *Nuttall;* Wats. Proc. Am. Acad. 14:289 (1879); Bot. Cal. 2:430 (1880); Gray, Syn. Fl. 1^1:159 (1895). *Cardamine californica* Greene, Fl. Fr. 266 (1891). *C. paucisecta* Benth. Pl. Hartw. 297 (1848), type loc. Monterey, *Hartweg* 174; B. & W. Bot. Cal. 1:30 (1876). *C. cuneata* Greene, Bull. Cal. Acad. 1:74 (1885), type loc. Jolon, Monterey Co., *Greene. D. cuneata* Greene, Pitt. 3:123 (1896). *Cardamine nuttallii* Greene, Bull. Cal. Acad. 2:389 (1887), Fl. Fr. 266 (1891). *C. sinuata* Greene, Erythea, 1:148 (1893), type loc. Crescent City, *Thomas Howell. D. sinuata* Greene, Pitt. 3:123 (1896). Var. TRACYI Jepson, Man. 426 (1925), type loc. Blue Slide, Van Duzen River, *Tracy* 5426. Var. PACHYSTIGMA Wats. Proc. Am. Acad. 14:289 (1879), type loc. Plumas Co., *Lemmon, R. M. Austin, Ames;* Jepson, Man. 426 (1925). *D. pachystigma* Wats.; Gray, Syn. Fl. 1^1:155 (1895).

4. **D. macrocarpa** Nutt. OREGON TOOTHWORT. Stem 4 to 8 inches high, arising from elongated thick rootstocks; leaves pinnately divided into 5 linear or oblong lobes ⅓ to 1 inch long, or sometimes palmately parted; cauline leaves 1 to 3; raceme nearly sessile; petals pink; pods 1 to 1½ inches long; styles in fruit 4 to 5 lines long. Shady slopes, 10 to 4000 feet: Plumas Co. to Del Norte Co. North to British Columbia. Mar.-Apr.

Locs.—Plumas Co. (Syn. Fl. 1^1:154); Humbug Mt., Siskiyou Co., *Butler* 1152; Crescent City, *Howell* 109.

Refs.—DENTARIA MACROCARPA Nutt.; T. & G. Fl. 1:88 (1838), type loc. Columbia River, *Nuttall;* Jepson, Man. 427 (1925). *C. pulcherrima* Greene, Erythea 1:148 (1893), type loc. Mosier, e. Ore., *Howell.*

15. **SMELOWSKIA** C. A. Mey.

Low caespitose perennials with stellate-pubescent herbage. Leaves deeply pinnatifid or bipinnatifid. Flowers in racemes, small, white, yellowish or purplish-tinged. Anthers slightly sagittate at base. Pod oblong-lanceolate or lanceolate, more or less obcompressed, the valves strongly keeled; style short.—Species 7, western North America and central Asia. (Timotheus Smielowski, Russian botanist, 19th century.)

Herbage densely whitish-pubescent; leaf-segments soft, obtuse; pods somewhat obcompressed but subteretish.—Sect. Eusmelowskia..........1. *S. calycina.*

Herbage greenish, thinly pubescent; leaf-segments rigid, acute; pods obcompressed, distinctly though not strongly flattened.—Sect. Polyctenium..........2. *S. fremontii.*

1. **S. calycina** C. A. Mey. (Fig. 135.) Plants 1½ to 4½ inches high; herbage densely whitish-pubescent; leaves chiefly in a basal tuft, ½ to 1½ inches long, the blades pinnately divided into linear or oblong segments 2 to 3 lines long; flowers white with rose-color veins, 1 to 2 lines long; pods linear, 3 to 5 lines long.

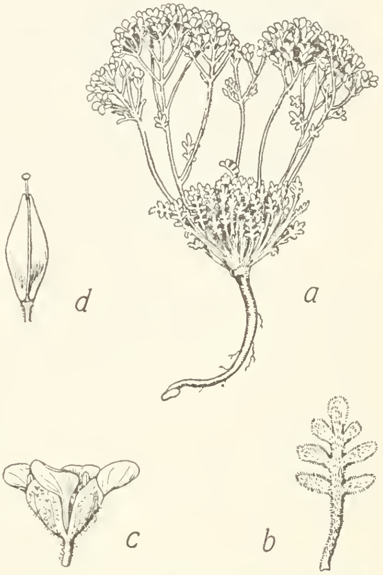

Fig. 135. Smelowskia calycina C. A. Mey. *a*, habit, × ½; *b*, leaf, × 2; *c*, fl., × 5; *d*, pod, × 3.

Montane, northern Sierra Nevada in southeastern Shasta Co. East to Colorado, north to Alaska.

Loc.—Lassen Peak, *Chesnut & Drew.*

Refs.—Smelowskia calycina C. A. Meyer; Ledeb. Fl. Alt. 3:170 (1831), type loc. Siberia; Jepson, Man. 427 (1925). *Hutchinsia calycina* Desv.; Hook. Fl. Bor. Am. 1:58, t. 17, fig. B (1830).

S. ovalis Jones, Proc. Cal. Acad. ser. 2, 5:624 (1895), type loc. Mt. Adams, Wash.; pods ovate, truncatish or subcordate at base, 1 to 2½ lines long.—Lassen Peak (Syn. Fl. 1^1:469). This is, apparently, only a reduced form of S. calycina C. A. Mey.

2. **S. fremontii** Wats. Stems erect, tufted on the root-crown, 2 to 5½ inches high; herbage greenish, thinly pubescent; leaves 1 to 1½ inches long, the blades divided into linear-subulate segments 3 lines long; flowers white or lemon-yellow; pods linear-oblong, 2½ to 5 lines long.

Dried swales or beds of former pools, 4200 to 5400 feet: hills and mountain valleys east of the Sierra Nevada crest from Plumas Co. to Modoc Co. North to Oregon. Apr.-June.

Locs.—Portola, Plumas Co., *K. Brandegee;* Amedee, Lassen Co., *Loughridge;* Eagle Lake and Madeline plains, *Lemmon;* Ewing Creek, Modoc Co., *R. M. Austin;* West Valley, Warner Mts., *L. S. Smith* 780; Tule Lake, *Manning;* Happy Camp, Modoc Co., *L. S. Smith* 1230.

Refs.—Smelowskia fremontii Wats. Proc. Am. Acad. 11:123 (1876), based on spms. from near Klamath Lake, *Fremont,* and n. Sierra Nevada, *Lemmon. Polyctenium fremontii* Greene, Lflts. 2:219 (1912). *Braya pectinata* Greene, Erythea 3:69 (1895), type loc. Ewing Creek, Modoc Co., *R. M. Austin.*

16. **ARABIS** L. Rock Cress

Ours erect and often tall annuals or biennials, or caespitose perennials. Flowers rose-purple, white or yellowish-white. Sepals greenish or purplish, erect and equal, or the lateral pair slightly saccate at base. Petals obovate or spatulate, with narrow claw and flat blade, commonly much exceeding the sepals. Pod flattened parallel to the partition, the valves more or less 1-nerved. Seeds more or less winged; cotyledons accumbent.—About 120 species, all continents, but mostly north of the equator. (Name from the land Arabia.)

A. Leaves all pinnately parted.

Plants decumbent, branching from base, hirsute; annual or biennial; mainland......1. *A. virginica.*

Plants erect, slender, branching above, glabrous; annual; insular..........2. *A. filifolia.*

B. Leaves entire or toothed, or only the basal pinnately parted.

1. *Seeds nearly marginless; basal leaves broad, mostly spatulate to obovate.*

Pods semi-terete, strictly erect; herbage glaucous, glabrous except at base; biennial..3. *A. glabra.*

Pods flattened, ascending or divaricate; herbage not glaucous.

Flowers greenish-white; herbage hirsute; biennial........ 4. *A. hirsuta.*

Flowers crimson or rose-purple, showy; herbage commonly glabrous but the leaves ciliate with forked hairs; perennial........ 5. *A. blepharophylla.*

2. *Seeds wing-margined; pods flattened or flattish.*

a. Pods narrowly linear.

Cauline leaves petioled, the blades entire or slightly toothed, the basal ones repand or dentate........ 6. *A. repanda.*

Cauline leaves mostly sessile.

Herbage glabrous or somewhat pubescent below; biennial or perennial; middle and high altitudes, Sierra Nevada.

Pods erect; root-crown slender (1 to 2 lines thick), simple or branching........ 7. *A. drummondii.*

Pods ascending; root-crown very thick (3 to 12 lines in diameter), commonly simple........ 8. *A. cognata.*

Herbage more or less pubescent; pods spreading or reflexed.

Plants 2 to 7 inches high; perennial.

Pedicels glabrous; flowers 2 to 3 lines long; high Sierra Nevada........ 9. *A. lemmonii.*

Pedicels pubescent; flowers 3 to 5 lines long; Coast Range peaks........ 10. *A. breweri.*

Plants 7 to 18 inches high.

Cauline leaves pinnately and rather closely incised; basal leaves narrowly linear, in silvery tufts; biennial or perennial........ 11. *A. subpinnatifida.*

Cauline leaves entire or merely dentate or serrate.

Root-crown simple or with few branches, rarely woody.

Corolla commonly white or nearly so, sometimes purple.

Flowering racemes at first very dense; flowers soon pendulous; pedicels puberulent; corolla white; fruiting racemes secund; biennial or perennial........ 12. *A. secunda.*

Flowering racemes loose; flowers not pendulous in anthesis; pedicels mostly pilose; corolla white or purple; fruiting racemes not secund; biennial........ 13. *A. retrofracta.*

Corolla dark red or pinkish-white.

Herbage hoary with a fine dense pubescence; pedicels glabrous or only scantily puberulent; Great Basin region.

Corolla 1½ to 2 lines long; stem scantily leafy; perennial........ 14. *A. canescens.*

Corolla 3½ to 4 lines long; stem densely leafy; biennial........ 15. *A. beckwithii.*

Herbage puberulent or pubescent; cismontane or mostly.

Fruiting racemes mostly secund; pods straight; root-crown simple or shortly branched; pedicels glabrous; corolla 2 to 3 lines long, white or pinkish; biennial; middle altitudes in the mts........ 16. *A. rectissima.*

Fruiting racemes not secund or rarely so; pods mostly curved; root-crown with long leafy branches; pedicels pubescent; corolla dark red, 3 to 5 lines long; perennial; chiefly in the foothills or at low altitudes in the mts........ 17. *A. arcuata.*

Root-crown with branches several to many, woody; desert perennials.

Ovary usually densely tomentulose; pods deflexed or pendent, 1½ lines wide; herbage canescent........ 18. *A. pulchra.*

Ovary glabrous or nearly so; pods mostly spreading or recurved, ¾ to 1 line wide........ 19. *A. perennans.*

b. Pods broadly linear to oblong or elliptic, flattened; perennials.

Pods pendent or deflexed, glabrous; plants 7 to 14 inches high.

Herbage glabrous; pods linear, 2 lines wide, acute or attenuate-acute at apex........ 20. *A. suffrutescens.*

Herbage canescent; pods oblong, rounded at each end, 3 lines wide........ 21. *A. glaucovalvula.*

Pods not pendent or deflexed.

Pods ascending; leaves hoary-canescent........ 22. *A. nardina.*

Pods erect.

Style ¼ to ⅓ line long or stigma sessile; herbage green.

Basal leaves not densely crowded, about 1 inch long........ 23. *A. platysperma.*

Basal leaves in a very dense tuft, 3 to 6 lines long........ 24. *A. inamoena.*

Style 2 to 2½ lines long; herbage canescent........ 25. *A. parishii.*

1. **A. virginica** Trel. Virginia Rock-cress. Annual or biennial, nearly glabrous; stems several from the base, decumbent or ascending, 7 to 15 inches high; leaf-blades deeply and pinnately parted into nearly uniform segments, the segments oblong or linear, few-toothed or entire; flowers small, white; pods linear, spreading, ¾ to 1 inch long, 1 line broad, on pedicels 1 to 2 lines long, beaked by a short pointed style; valves faintly veined or obscurely 1-nerved at base; seeds in 1 row.

Open places, or low ground, 10 to 200 feet: lower San Joaquin Valley to Southern California and northern Lower California. East to Texas and Virginia. Apr.-Oct.

Locs.—Stockton, *Davy*, *Sanford* 340; Tracy, *Michener & Bioletti;* Inglewood, Los Angeles Co. (Abrams, Fl. Los. Ang. 178); San Diego, *C. F. Baker* 1644. Tiajuana, L. Cal., *Orcutt* 1459.

Refs.—Arabis virginica Trel.; Branner, Rep. Geol. Surv. Ark. 1888: 165 (1891); Jepson, Fl. W. Mid. Cal. 219 (1901), ed. 2, 186 (1911), Man. 428 (1925). *Cardamine virginica* L. Sp. Pl. 656 (1753), type loc. Virginia. *Planodes virginicum* Greene, Lflts. 2:221 (1912). *Cardamine ludoviciana* Hook. Jour. Bot. 1:191 (1834), "banks of the Mississippi," *Nuttall*. *A. ludoviciana* Meyer, Ind. Sem. Petrop. 9:60 (1842).

2. **A. filifolia** Greene. Island Rock-cress. Delicate annual; stem erect, slender, branching above, 8 to 12 inches high; herbage glabrous, somewhat glaucous; leaf-blades pinnately divided with filiform lobes, ¾ to 1 inch long; flowers roseate or purple; petals roundish-obovate, narrowed to a claw, 2½ to 3 lines long, about twice as long as the sepals; pods ascending or somewhat spreading, almost filiform-linear, acute, 1¼ to 1½ inches long; seeds in 1 row.

Shady north slopes, perhaps about 500 to 1000 feet: Santa Cruz Island.

Refs.—Arabis filifolia Greene, Bull. Cal. Acad. 2:390 (1887); Gray, Syn. Fl. 1^1:159 (1895); Jepson, Man. 428 (1925). *Cardamine filifolia* Greene, Pitt. 1:30 (1887), type loc. Santa Cruz Isl. *Greene*.

3. **A. glabra** Bernh. Tower Mustard. Stems bluish-green, erect, simple (very rarely branched), 2 to 4 feet high from a biennial root; herbage glaucous and glabrous but often hispidulous at base; blades of basal leaves broadly spatulate to narrow-obovate, coarsely dentate or merely denticulate, 1¼ to 4½ inches long, soon withering; blades of cauline leaves ovate to lanceolate, entire, clasping by a sagittate base; petals dull white, 2 to 3 lines long, little exceeding the sepals; pods strictly erect or even appressed to the stem, straight, 3 to 4 inches long, ½ to ¾ line wide, on pedicels 3 to 5 lines long; seeds in 2 rows, narrowly winged or wingless.

Foothills and mountains, 100 to 4700 feet: Coast Ranges, Sierra Nevada, and cismontane Southern California, widely distributed and not rare, but the plants commonly solitary. North to Canada and east to New England; Europe, Asia, Australia. Apr.

Locs.—Sierra Nevada: Pit River, Modoc Co., *M. S. Baker;* Big Mdws., Plumas Co., *T. Brandegee;* Bear Valley, Nevada Co., *Jepson* 13,389; Glen Alpine, *Pendleton & Reed* 1207; Dorrington, Calaveras Co., *Jepson* 10,184; Pine Ridge, Fresno Co. Coast Ranges: Yreka, *Butler* 122; summit New River trail, Trinity Co., *Jepson* 1994; Hupa, *Chandler* 1337; Blue Lakes, Lake Co., *Jepson;* St. Helena, *Jepson* 32c; Mill Valley, Marin Co., *H. A. Walker* 632; Fish Ranch, Berkeley Hills, *Jepson* 13,388; Saratoga foothills, *Pendleton* 720. Southern California: Fort Tejon, *Davy* 2333; Santa Monica Cañon, *Barber* 313; Rubio Cañon, San Gabriel Mts., *Peirson* 390; Saunder Mdw., Mt. San Jacinto, *C. V. Meyer* 198; Vandeventer, San Jacinto Mts., *Jepson* 1431.

Refs.—Arabis glabra Bernh. Syst. Verz. Erf. 195 (1800); Jepson, Fl. W. Mid. Cal. 219 (1901), ed. 2, 286 (1911), Man. 428 (1925). *Turritis glabra* L. Sp. Pl. 666 (1753), type European. *A. perfoliata* Gray, Syn. Fl. 1^1:160 (1895).

4. **A. hirsuta** Scop. Hairy Rock-cress. Biennial; stem erect, simple or strictly branched, 1 to 3 feet high; herbage deep green, rather sparsely hirsute; leaf-blades entire or sparingly dentate, those of the basal oblanceolate to elliptic-oblong, 1 to 3 inches long, narrowed to short winged petioles, those of the cauline

oblong to lanceolate, sessile by a subcordate or auriculate base; petals white, 2 to 4 lines long; pods linear-filiform, 1½ to 2¾ inches long, ⅓ to ½ line wide, erect, on slender pedicels 2 to 5 lines long; valves faintly nerved below the middle and more or less veined; style scarcely any; seeds in one row, suborbicular, very narrowly margined.

Mostly montane and 4000 to 8000 feet: widely scattered in California, but rare. East to Georgia and north to Alaska. Europe, Asia. May-June.

Locs.—Willow Creek Valley, Modoc Co., *R. M. Austin;* Burney Falls, Shasta Co., *Baker & Nutting;* Inverness, *Drew;* Yosemite, *Alice King;* South Fork Santa Ana River, San Bernardino Mts., *Peirson.*

Refs.—ARABIS HIRSUTA Scop. Fl. Carn. ed. 2, 2:30 (1772), type loc. Carniolia, head of the Adriatic; Jepson, Fl. W. Mid. Cal. 219 (1901), ed. 2, 186 (1911), Man. 428 (1925).

5. **A. blepharophylla** H. & A. ROSE CRESS. (Fig. 136.) Stems few or several from the crown of a perennial root, 4 to 8 (or 12) inches high; herbage deep green, somewhat pubescent, the leaves with scattered flocs of hairs or sometimes glabrous save for the ciliate margins; leaf-blades dentate or entire, blades of the basal leaves broadly spatulate or obovate to elliptic, obtuse, 1 to 2¾ inches long, the cauline leaves few, their blades oblong, sessile; flowers large and fragrant; sepals often colored, broad, 2 to 3 lines long, one pair more or less saccate at base and broader than the other pair; petals rose-purple, 5 to 7 lines long; pods erect or ascending, straight or nearly straight, glabrous, 1 to 1½ inches long, 1 line wide, abruptly beaked by a short stout style; valves veined, 1-nerved; seeds in 1 row, round-elliptical, narrowly winged or barely margined.

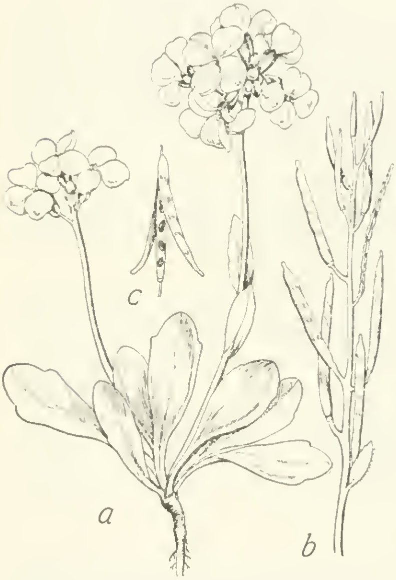

Fig. 136. ARABIS BLEPHAROPHYLLA H. & A. *a*, habit, × ½; *b*, fr. branchlet, × ½; *c*, dehiscing pod, × ½.

Rocky hillsides and ridges near the sea, 5 to 1000 feet: Sonoma Co. to Santa Cruz Co. Mar.-Apr.

Locs.—Bodega Bay, *Alice Griffin;* Pt. Reyes, *Abrams* 11,585; Mt. Tamalpais, *Newlon* 93; Sausalito, *Alma Ames;* Red Rock, San Francisco Bay, *Jepson* 13,386; Mt. Davidson, San Francisco, *Jepson* 10,344; San Bruno Hills, *Jepson* 5i; Montara Mts., *Ferris;* Santa Cruz Co. (Anderson, Nat. Hist. Santa Cruz Co. 35).

This species has long been attributed to Monterey: by Brewer and Watson, Bot. Cal. 1:32,—1876; by Gray, Syn. Fl. 1^1:161,—1895; and by other authors following them, including the present writer. We have, however, never collected it at Monterey and there are no specimens of it from Monterey Co. in the herbaria at Berkeley, Stanford or Pacific Grove, and we have no definite modern record of the occurrence of this species on the Monterey Peninsula.

Var. **macdonaldiana** Jepson. Stems 3 to 5 inches high, several from a branched caudex; herbage glabrous; petals oblanceolate, truncate, 4 lines long; stamens with broad filaments, the upper and lower pairs exceeding the sepals, the lateral pair much shorter.—Northwestern Mendocino Co.

Refs.—ARABIS BLEPHAROPHYLLA H. & A. Bot. Beech. 321 (1840), type from Cal., *Douglas;* Hook. f. Bot. Mag. t. 6087 (1874); Jepson, Fl. W. Mid. Cal. 219 (1901), ed. 2, 186 (1911), Man. 428 (1925). Var. MACDONALDIANA Jepson, Man. 429 (1925). *A. macdonaldiana* Eastw. Bull. Torr. Club 30:488 (1903), type loc. Red Mt., nw. Mendocino Co., *Eastwood.*

In the Botanical Magazine (t. 6087) J. D. Hooker cites San Francisco as the station for the Douglas collection, but there is no locality given on the original Douglas spm. (Herb. Hook., Kew). Search at Kew and elsewhere gives no evidence that a definite station is known for any

Californian herbarium specimen of Douglas. It is significant that the elder Hooker (W. J.), who had most to do with the Douglas plants, does not cite in the Botany of the Beechey a definite locality for a seed plant in the case of Douglas' California material save in two dubious instances.

6. **A. repanda** Wats. YOSEMITE ROCK-CRESS. Stem from a biennial root, 1¼ to 1¾ (or 2) feet high, branching above; herbage stellate-pubescent, or the hairs at base simple and longer, the upper parts sometimes subglabrous; basal leaves somewhat rosulate, the blades obovate to oblanceolate, repandly few-toothed, coarsely dentate or nearly entire, narrowed to a commonly short petiole, 2 to 4 (or 7) inches long; upper leaves smaller, the blades narrowly oblanceolate or linear; sepal pairs unequal in breadth; petals dull white, narrow, approximate, 2 to 3 lines long, a little exceeding the sepals; pods glabrous, spreading and more or less curved, anastomosely few to several-nerved on the sides, 2½ to 4½ inches long, 1½ to 2 lines wide, borne on usually stout ascending pedicels 1 to 2 lines long; seeds in one row, elliptical, broadly winged.

Montane, dry or gravelly slopes, 6000 to 8500 feet: Sierra Nevada from Mariposa Co. to Tulare Co., thence westerly to the San Emigdio Range and southerly to the San Gabriel and San Jacinto mountains. May.

Tax. note.—The basal leaves are sometimes a little shaggy and grayish. There is, however, every intergrade to plants with leaves less hairy and green. Both states may be found in plants of lower altitudes. Plants of higher altitudes tend to have greenish leaves. See the variety described below.

Locs.—Rancheria Mt., Tuolumne Co., *Jepson* 4588; Yosemite, *Jepson* 10,449; Horse Corral Mdw., Kings Cañon, *Jepson* 766; Round Mdw., Giant Forest, *Jepson* 682; Middle Tule River, *Purpus* 3007; Tehachapi, *Greene;* Mt. Pinos; Rock Creek, San Gabriel Mts., *Peirson* 507; Lytle Creek Cañon, Mt. San Antonio; Bear Valley, San Bernardino Mts., *Parish* 3752; South Fork Santa Ana River, *Munz* 6227; Tahquitz Valley, San Jacinto Mts.

Var. **greenei** Jepson nom. n. Plants 7 to 9 inches high; herbage greenish; pods glabrous, shining, finely nerved.—High montane, w. Inyo Co. In 1908 Greene published a high-montane dwarf related to A. platyspermum as A. inamoena (Fedde, Rep. 5:243). In 1911, having forgotten his previous use of this specific name, he published, as a segregate of A. repanda, a plant with greenish herbage and shining pods from Lake Sebrina on the eastern slope of the Sierra Nevada in Inyo Co., under the name A. inamoena (Lflts. 2:158). It is this latter plant that we are here considering. The pods in the typical form of A. repanda are puberulent, but the pods of plants in Tulare Co. are less puberulent or almost glabrous, though not quite glabrous; sometimes the pods are shining. Such characters, in this case, we do not regard as reliably specific. Therefore, A. inamoena Greene (1911), not A. inamoena Greene (1908), is at most of varietal value and we give it the name var. greenei.

Refs.—ARABIS REPANDA Wats. Proc. Am. Acad. 11:122 (1876), type loc. Yosemite Valley, *Bolander* 4881; B. & W. Bot. Cal. 1:32 (1876); Jepson, Man. 429 (1925). Var. GREENEI Jepson. *A. inamoena* Greene, Lflts. 2:158 (1911), type loc. Lake Sebrina, Bishop Creek, Inyo Co., *Davidson* 2729; not A. inamoena Greene (1908).

7. **A. drummondii** Gray. CANADA ROCK-CRESS. Stems one or few from a biennial root-crown, erect, leafy, mostly simple, 1 to 2 feet high; root-crown simple or sometimes shortly branched; herbage glabrous or a little pubescent below; blades of basal and lower cauline leaves oblanceolate, narrowed below to a petiole, entire, ½ to 1¼ inches long; blades of cauline leaves linear-oblanceolate to linear-lanceolate, sessile-sagittate; petals white to rose-color, 3 to 4 lines long; pods erect, crowded, 1½ to 2½ inches long, 1 line wide; seeds narrowly winged, 1 line long.

Montane slopes, 5500 to 8000 feet: White Mts.; Sierra Nevada from Madera Co. to Nevada Co.; thence nw. to Siskiyou Co. East to Rocky Mts., north to Canada. June.

Tax. note.—Plants with a single stem represent the extreme in habital form of this species but are not at all separable from plants with two to several stems. The cauline leaves are sagittate, in the var. alpina commonly not sagittate. Biennial forms intermediate between the species and the perennial var. alpina apparently occur: High Grade district, Modoc Co., *L. S. Smith* 961 (cauline leaves sagittate); Mt. Lola, Nevada Co., *Hall & Babcock* 4539 (cauline leaves not sagittate or not obviously so). A tall (2 feet high) robust plant collected by Congdon, "east of Minarets", is apparently perennial; it has sagittate cauline leaves.

Locs.—White Mts., *Shockley* 500; upper San Joaquin River, Madera Co., *Congdon;* Rancheria Mt., Yosemite Park, *Jepson* 4584; Deer Park, Placer Co., *Davy* 3247; Summit sta., Nevada Co., *Jepson* 13,343; Log Lake, Shackelford Creek, Siskiyou Co., *Butler* 123, 1664.

Var **alpina** Wats. Stems slender, several from the slender branches of a loosely branched perennial rootcrown, ½ to 5 (or sometimes 12) inches high; herbage glabrous, rarely puberulent below; blades of basal leaves oblanceolate, narrowed below to a petiole, entire or rarely few-toothed, 5 to 13 lines long; blades of cauline leaves linear or lanceolate, sessile, commonly not sagittate; petals purple, 1½ to 3 lines long; pods ascending or erect, 1¼ to 2 inches long.—Loamy or sandy soil, 8000 to 11,600 feet: Sierra Nevada from Inyo Co. and Tulare Co. to Modoc Co. North to British Columbia; east to Montana and Utah. June-July.

Tax. note.—While Watson's original description of Arabis lyallii calls for sagittate cauline leaves, these are only occasionally sagittate. Examples of sagittate leaves may be found in plants from Elkhorn Mt., Mont., *T. Brandegee*, and Mt. Rainier, Wash., *O. D. Allen* 299, but not in the California specimens cited below, though plants with sagittate leaves may be expected.

Locs.—Little Kern River, Tulare Co., *Purpus* 1815; Rock Creek, near Mt. Whitney, *Jepson* 5059a; Yosemite Park, *Jepson* 3305 (Mt. Dana), 4561 (Macomb Ridge), 4551 (Tower Peak); Mt. Bidwell, *Jepson* 7893.

Refs.—ARABIS DRUMMONDII Gray, Proc. Am. Acad. 6:187 (1864). *Turritis stricta* Graham, Edinb. N. Phil. Jour. 7:350 (1829), type loc. n. Rocky Mts., *Drummond.* Var. ALPINA Wats. Bot. King 18 (1871), type loc. w. Nevada. *A. lyallii* Wats. Proc. Am. Acad. 11:122 (1876). *A drummondi* var. *lyallii* Jepson, Man. 429 (1925).

8. **A. cognata** Jepson. LADY ROCK-CRESS. Stems slender, few to many, 2 to 4 inches high, ascending from a very stout and densely scaly perennial root-crown 3 to 12 lines broad; herbage glabrous; basal leaves with oblanceolate blades tapering gradually to a slender petiole as long or longer than the blade, ¾ to 2 inches long, 2 to 3 lines wide; cauline leaves few and small (the blades obovate, sessile) or sometimes none; flowers rose-purple, 3½ lines long; fruiting pedicels slender, 3 to 7 lines long; pods spreading or ascending, ¾ to 1¾ inches long, 1 line wide; seeds winged at apex, ½ line long.

Montane, 5700 to 7800 feet: Sierra Nevada from Mariposa Co. to Plumas Co.

Locs.—Near Yosemite, *Hall & Babcock* 3436; Mt. Elwell, Plumas Co.

Ref.—ARABIS COGNATA Jepson, Man. 429 (1925), type loc. Mt. Elwell, *C. M. Wilder.*

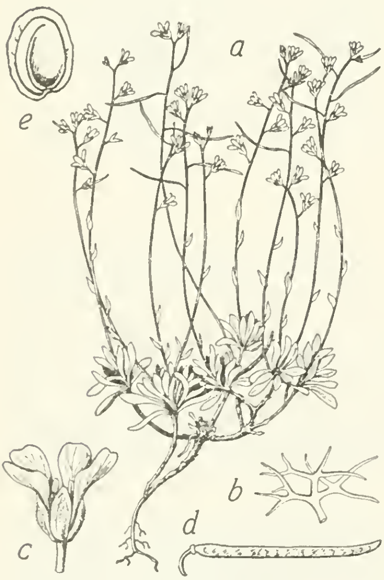

Fig. 137. ARABIS LEMMONII Wats. *a*, habit, × ⅓; *b*, epidermal hair, × 90; *c*, fl., × 2½; *d*, pod, × ¾; *e*, seed, × 7.

9. **A. lemmonii** Wats. SOLDIER ROCK-CRESS. (Fig. 137.) Stems few to many from a branched perennial crown, 3 to 9 inches high; herbage pubescent, occasionally glabrous above; blades of lower leaves spatulate to oblanceolate, narrowed to a petiole, the whole 3 to 6 or 8 lines long, covered with a fine close pubescence or even whitish felt, the hairs short with the branches rebranched; flowers light purple, 2 to 3 lines long; pods glabrous, 1 to 1½ inches long, widely spreading or recurved; pedicels glabrous.

Rocky places, 6000 to 11,000 feet: White Mts.; Sierra Nevada from Tulare and Inyo Cos. to Shasta and Siskiyou Cos. North to British Columbia, east to Montana and Wyoming. May-June. It is very near A. breweri in habit and character, but the stems are more slender and the leaves grayer.

Locs.—White Mts.: North Fork Crooked Creek, *Jepson* 7278, 7300; Big Prospector Mdw., *Jepson* 7334. Sierra Nevada: Olancha Peak; Farewell Gap, *Jepson* 1016, 1036; Timosea Peak, Inyo Co., *Jepson* 5079; Kaiser Peak, *Jepson* 13,019 (pedicels pubescent); Lundy Trail, Mt. Warren, *Congdon;* Mt. Dana, *Jepson*

3303; Sonora Peak, Tuolumne Co., *A. L. Grant* 397; Mt. Tallac; Desolation Valley, Eldorado Co., *Jepson* 8173 (pedicels pubescent); Tinkers Knob, Placer Co., *Sonne;* Lassen Peak, *Chesnut & Drew;* Hot Springs Valley, n. Plumas Co., *Jepson* 12,288. Siskiyou Co.: Highland Mine, *Butler* 892.

Refs.—ARABIS LEMMONII Wats. Proc. Am. Acad. 22:467 (1887), based on plants from the Rocky Mts. to the Sierra Nevada and Cascades; Jepson, Man. 430 (1925). *A. austinae* Greene; Fedde, Rep. 5:242 (1908), type loc. Little Chico Creek, *R. M. Austin. A. polyclada* Greene, Lflts. 2:75 (1910), type loc. Farewell Gap, *Purpus* 1897. *A. depauperata* Nels. & Ken. Proc. Biol. Soc. Wash. 19:36 (1906), type loc. Mt. Rose, Nev., *Kennedy* 1167. *A. kennedyi* Greene, Lflts. 2: 71 (1910), type loc. Galena Creek, mts. of Washoe Co., Nev., 8000 ft., *P. B. Kennedy.*

A. DAVIDSONII Greene, Lflts. 2:159 (1911), type loc. North Fork Bishop Creek, Inyo Co., *A. Davidson* 2728; Davidson, Bull. S. Cal. Acad. 13:43 (1914). Low glabrous perennial; corolla white or pinkish, 3 lines long; pods narrow, subfalcate, 1½ inches long (ex char.).—It is apparently near A. lemmonii Wats. but F. J. Smiley (Univ. Cal. Publ. Bot. 9:205) reduces it to varietal rank as A. lyallii var. davidsonii Smiley. He cites under the variety C. M. Wilder's Mt. Elwell plant which we have named A. cognata.

10. **A. breweri** Wats. BREWER ROCK-CRESS. Stems many from the much-branched crown of a stout woody root, 2 to 6 inches high; herbage pubescent, the hairs seldom more than 3-forked; leaves light-colored or whitish, especially beneath, as if glaucous; blades of the lower leaves broadly spatulate, entire, 3 to 10 lines long, the petioles ciliate; upper leaves with lanceolate to oblong blades sessile by a subcordate base or obtusely auriculate; flowers bright red-purple or nearly white, 3 to 5 lines long, the pedicels and purplish calyx more or less pubescent; pods spreading and arcuate, glabrous, 1½ to 2½ inches long, 1 line broad; valves 1-nerved, veined; seeds orbicular, narrowly winged, in one row or nearly so.

Rocky summits of mountain peaks, 3800 to 5500 feet: Coast Ranges from Mendocino Co. to Monterey Co. Apr.

Locs.—Castle Peak to Middle Eel River, *Jepson* 13,373; Mt. Hull, *Hall* 9570; Snow Mt., Lake Co., *T. Brandegee;* Pope Valley grade summit (e. of Calistoga), *K. Brandegee;* Mt. Diablo, *Greene;* Mt. Hamilton, *Pendleton* 888; Loma Prieta, *Davy* 449; San Antonio trail, Santa Lucia Mts., *Jepson* 1662.

Geog. note.—As an indigenous habitant of the central Coast Range peaks this species is a definite type fairly well characterized. Beyond this range and towards the north, especially in Siskiyou County, it shades, however, into A. lemmonii Wats., from which it becomes not easily distinguishable. The plants of the northern Sierra Nevada are often not typical A. lemmonii Wats., but we are referring them to that species, partially on geographic grounds: for example, a very slender specimen from Desolation Valley (*Jepson* 8173) is here listed as A. lemmonii Wats., in spite of the fact that it has pubescent pedicels.

Var. **figularis** Jepson var. n. Herbage more hairy; pods rather strictly ascending.—(Pubescentior; siliquae strictiusculo-ascendentes.)—Potter Valley, Mendocino Co., *C. A. Purpus* (type).

Refs.—ARABIS BREWERI Wats. Proc. Am. Acad. 11:123 (1876), type loc. Mt. Diablo, *Brewer, Bolander;* Jepson, Fl. W. Mid. Cal. 220 (1901), ed. 2, 187 (1911), Man. 431 fig. 418 (1925). *A. epilobioides* Greene; Fedde, Rep. 5:242 (1908), type loc. Mt. Sanhedrin, *Heller. A. polytricha Greene,* Lflts. 2: 72 (1910), type loc. Yreka, *Butler,* probably belongs here also. Var. FIGULARIS Jepson.

11. **A. subpinnatifida** Wats. TWO-WAY ROCK-CRESS. Stems simple, 1 or few from a biennial or perennial root, 8 to 12 inches high; herbage (especially the leaves) canescent or almost silvery; basal leaves tufted, the blades very narrowly linear or oblong to linear-oblanceolate, entire or rarely sparingly toothed, 4 to 12 lines long, on petioles about as long; blades of the cauline leaves lanceolate, unequally or saliently incised, sometimes merely toothed, or the uppermost entire; petals rose-color or white, 5 to 7 lines long; pods glabrous or pubescent, straight or slightly curved, 2 to 3 (or 5) inches long, 1 to 1½ lines wide, markedly attenuate to a short style, and pendent upon recurved or spreading puberulent or hairy pedicels 2 to 5 lines long; valves 1-nerved to the middle and veined; seeds in 1 row, as broad as the partition, winged.

Mountains and plateau valleys, 3000 to 5000 feet: Siskiyou Co. Southwestern Oregon to northern Nevada. Apr.

Tendency to leaf dimorphism.—The basal leaf rosettes, especially those borne on sterile shoots, commonly exhibit dense silvery tufts of very narrow entire leaves. In the most marked state of the species the broader cauline leaves are pectinately incised. The differences between the two extreme types of leaves show, therefore, a strong development in the direction of dimorphism. In addition to its peculiar foliage the species is distinguished by the attenuate or somewhat gladiate form of the pods.

Locs.—Shackelford Cañon, *Butler* 1763 (in part); Greenhorn Mt., *Butler* 685 (white-flowered); Humbug Mt., *Butler* 587; Yreka, *Butler* 587, 1446; Edgewood, *J. W. Kisling*. Ore.: Tennessee Pass near Kirby, *Henderson* 5918.

Refs.—ARABIS SUBPINNATIFIDA Wats. Proc. Am. Acad. 20:353 (1885), based on spms. from West Humboldt Mts., Nev., *Watson*, Scott Valley, Siskiyou Co., *Greene*, and Waldo, Ore., *Howell*; Jepson, Man. 431 (1925).

12. **A. secunda** Howell. SUMMIT ROCK-CRESS. Biennial or perennial; stems simple, several from the base or solitary, branched above, 8 to 18 inches high; herbage densely pubescent below, scantily pubescent above; leaves 1 to 1½ inches long, the blades of the basal petioled, oblanceolate, repand-toothed, the blades of the cauline sagittate-clasping, oblong-linear, repand or entire; flowers white, becoming pendent on pubescent pedicels; petals white, 3½ lines long; pods narrow, secund, deflexed, 1½ to 2½ inches long.

Montane slopes, 5000 to 6000 feet: northern Humboldt Co. and western Siskiyou Co. North to Washington. June-July.

Tax. note.—Certain American authors, particularly the authors of the Botany of California and of the Synoptical Flora of North America, have not infrequently determined certain West American plants of the Transition Zone as Arabis holboellii Hornem. This species was based on specimens from Disco Island in the Arctic Ocean and is portrayed in an excellent illustration in the Flora Danica, pl. 1879. While the present writer has also (Man. 429,—1925) referred various Californian plants to this species in the status of varieties, such reference of California plants, which are in some cases of the Arid Transition Zone, to a truly boreal species seems so problematical that the step is here taken of recognizing these plants of the Arid Transition under specific designations.

As figured in the detail drawing in the Flora Danica (vol. 11, pl. 1879) the petals of A. holboellii are 2½ times as long as the sepals; the flowers and fruits are both distinctly secund; the flowering raceme is loose; the flowers spread horizontally; the petals are white; the filaments are dilated at the base and middle and contracted above; and the pods are (for the most part) only slightly curved. Of our Californian forms A. secunda Howell is, perhaps, nearest the plant of the Arctic Ocean, but its sepals are a little over half as long as the petals; its raceme is at first capitate-congested, though promptly becoming looser below with the flowers soon pendulous; its longer stamens have filaments equally dilated throughout.

A. retrofracta Graham is often quoted as a synonym of A. holboellii; as represented by Californian material, A. retrofracta has a coarser and more abundant pubescence; its racemes are not secund; its pedicels are usually pilose. A. arcuata Gray is even further removed; its habit is coarser; its corolla is usually dark red; its petals are about 1½ times as long as the sepals; its racemes are not secund, but its pods are strongly curved.

It appears that a series of allied forms reaches across the continent from Southern California, Arizona and New Mexico to Disco Island in the Arctic Ocean, the type locality for Arabis holboellii. While the northerly end of the series is not well known to us and much is still lacking in the way of knowledge of the life history of our own forms, we are disposed, at this time, to look upon certain of the published segregates of the Arid Transition Zone as best disposed in specific rank. There seems to be fairly sufficient grounds, geographically and morphologically, to warrant this step.

In Pittonia (4:187–189) E. L. Greene has, to be sure, already taken the stand that Arabis holboellii is to be excluded from the North American mainland flora and he publishes segregates formerly resting under the larger concept, but he does not organize his series monographically. Consequently one can not so readily make appraisement of his species or the basis of his ideas. While his diagnoses bespeak the polished scholar, his usual practice led him to quote but a single specimen or only a few specimens, so that, sometimes, his species are, perhaps, neglected from lack of means to appreciate them. For example, after much study, Arabis rectissima Greene is now, apparently, reasonably clear to us. Regardless of what differences of opinion may eventually develop as to its status, it is a fairly definite form of the Sierra Transition Zone, specimens of which, derived from the length of that mountain chain, can be quoted freely from a number of large American herbaria.

Some of our units of this group are still quite diverse in content. Arabis retrofracta Graham is one of these. As received here the plants included under this name are varied in appearance and considerably unlike in character of pubescence, and in length and curvature of pods. The material seems to represent, however, an involved complex, which we are, at present, unable to resolve into definite phylogenetic lines.

The entire series from Arabis secunda to A. pulchra admittedly represents very closely related types, each of them possessing more or less of mystifying outliers. But our series, as worked out, is, we believe, in the interests of further investigation of the life history of these plants along useful lines. We cite below some California stations for A. secunda.

Locs.—Grouse Mt., *Tracy* 4838; Trinity Summit, *Davy* 5859; Klamath River, *Chandler;* Marble Mt., Siskiyou Co., *Jepson* 2834.

Refs.—ARABIS SECUNDA Howell, Erythea 3:33 (1895), type loc. Mt. Adams, Wash., *Suksdorf, Howell. A. arcuata* Gray var. *secunda* Rob.; Gray, Syn. Fl. 1^1:164 (1895). *A. sparsiflora* Nutt. var. *secunda* Piper, Contrib. U. S. Nat. Herb. 11:294 (1906). *A. holboellii* var. *secunda* Jepson, Man. 430 (1925).

13. **A. retrofracta** Graham. NORTHERN ROCK-CRESS. Biennial; stem usually solitary, erect, simple or branched, 7 to 24 inches high, pubescent with simple or forked hairs; leaves pubescent with hairs more or less forked to stellate; blades of the basal leaves oblanceolate, repand-dentate, ¾ to 1½ inches long, blades of the cauline linear-oblong, acute, entire, ½ to 1 inch long; flowers white or purple, 2 to 3 lines long; pods linear, straight or arcuate, 1½ to 2 inches long, more or less reflexed or spreading, seldom strictly secund; pedicels hairy or rarely pubescent.

Montane, 3500 to 6000 feet: Trinity Co. to Siskiyou Co.; Plumas Co. to Modoc Co. North to Washington, east to Idaho, thence to British America. June. See note under no. 12.

Locs.—Dorleska, Trinity Co., *Hall* 8600; Quartz Valley, Siskiyou Co., *Butler* 610; Yreka, *Butler* 592, 723, 728; Goosenest foothills, Siskiyou Co., *Butler* 1331; Goose Lake, *C. C. Bruce* 2247a; Forestdale, Modoc Co., *M. S. Baker;* Eagle Lake, *J. Grinnell;* Hot Springs Valley, Lassen Peak, *Jepson* 12,287, 12,294.

Refs.—ARABIS RETROFRACTA Graham, Edinb. New. Phil. Jour. 7:345 (1829), type from the region between Hudson Bay and Rocky Mts., *Richardson. A. holboellii* var. *retrofracta* Jepson, Man. 429 (1925). *A. holboellii* B. & W. Bot. Cal. 1:33 (1876), in part. *A. sparsiflora* Nutt.; T. & G. Fl. 1:81 (1838), type loc. near the sources of the Columbia River, *Nuttall. A. arcuata* Gray var. *subvillosa* Wats.; Gray, Syn. Fl. 1^1:164 (1895). *A. campyloloba* Greene, Pitt. 4:192 (1900), type loc. Yreka, *Greene. A. tenuis* Greene, Pitt. 4:189 (1900), type loc. mts. of e. Wash., *Suksdorf. A. brucae* Jones, Contrib. W. Bot. 14:37 (1912), type loc. hills near Davis Creek, *C. C. Bruce;* apparently of the A. retrofracta aggregate; entire plant glabrous (ex char.).

Arabis bolanderi Wats. Proc. Am. Acad. 22:467 (1887). Watson quotes three collections. Of these we take as the type the first mentioned, "Yosemite Valley or Mono Pass (*Bolander*)". The label on the Bolander specimen (Gray Herb.) reads in this manner: "with 6270 or 6273". No. 6270 means Mariposa Grove, but no plant like this is known to us from that region. No. 6273 is recorded in the Bolander Field Book as "Arabis. Mono Pass". We take this to be the type locality. The plant of the type collection bears only sterile pods of distinctive outline. These plants are well matched by similar sterile specimens from the high central Sierra Nevada as follows: Mt. Ralston, *H. M. Evans* (one individual of the collection showing, significantly, one fertile pod) and Upper Echo Lake, Tahoe region, *E. O. Essig.* This matter is more fully discussed by the writer in Madroño 1:254–255 (1929). It is our judgment that Watson's binomial must be a synonym of A. retrofracta Graham.

14. **A. canescens** Nutt. GRAY ROCK-CRESS. Stems slender, 1 or few from the simple or branched crown of a taproot, 5 to 8 (or 17) inches high, finely puberulent, scantily leafy but with small yet dense tufts of narrow leaves at base; blades of leaves of the basal tufts narrow-oblanceolate, acute, 3 to 7 lines (or to 1¾ inches) long, closely white-tomentulose; cauline leaves mostly few and scattered, their blades linear, clasping; racemes short (1 to 2, or 4, inches long); flowers small, 1 to 1½ lines long; petals white; pods pendulous, typically narrow (⅔ to ¾ line wide) and straight-edged, strongly compressed, commonly glabrous, 1 to 1¾ inches long, on pedicels 1¼ to 3 lines long; seeds winged, in 2 rows.

Dry mountain slopes, 5000 to 8000 feet: Modoc Co. East to Wyoming, north to eastern Oregon. May-June.

Tax. note.—Little studied in the field and scantily represented in herbaria, this species is probably limited in its typical form to the northern part of the Great Basin. It is perhaps not rare in the region of eastern Oregon, though obscurely known as occurring in northeastern California. Our description is based primarily on a part of the original collection of Nuttall as preserved in the Kew Herbarium, the label, "Arabis canescens. R. Mts.," being in the hand of Nuttall. He also collected it in the Blue Mts., Ore. (Syn. Fl. 1^1:166). The narrow pods and the tufts of small whitish leaves make a distinctive impression upon the mind but are difficult to define in differential terms. Arabis canescens is allied to A. retrofracta Graham, but its pods are narrower and much flatter than in the latter species.

Locs.—Eagle Peak, Warner Mts., *L. S. Smith* 815. Ore.: Dry Creek, Crook Co., *Leiberg* 3421.

Refs.—ARABIS CANESCENS Nutt.; T. & G. Fl. 1:83 (1838), type loc. n. Rocky Mts., *Nuttall;* Gray, Syn. Fl. 1^1:165 (1895).

15. **A. beckwithii** Wats. LIEUTENANT'S ROCK-CRESS. Stems 1 or few from a simple or branched biennial root-crown, erect, simple or paniculately branching above, 5 to 12 inches high, rather densely leafy; herbage hoary with a fine dense pubescence, the inflorescence tending to be glabrous or glabrate; leaf-blades oblong- or linear-lanceolate, entire or dentate, ½ to 1 inch long, the cauline leaves sessile, the basal narrowed to a slender petiole; raceme comparatively few-flowered and soon loose; pedicels glabrous or scantily puberulent; sepals slightly over half as long as the petals; petals purple, 3½ to 4 lines long, the limb obovate; pods 1½ to 2½ inches long, ¾ to 1 line wide, glabrous, straight or somewhat curved, more or less pendent on recurved or deflexed pedicels 2 to 3 (or 4) lines long.

Rocky slopes, 4000 to 7600 feet: east side of the Sierra Nevada crest from Inyo Co. to Modoc Co. East to Nevada, north to eastern Oregon. June.

Tax. note.—The difficulties in distinguishing this species from A. retrofracta are often considerable. Typically the stem in A. beckwithii is densely leafy and the stellate-pubescent herbage inclines to be silvery in aspect, while the stem in A. retrofracta is much less leafy and the herbage tends somewhat to green or greenish.

Locs.—Goose Lake, *C. C. Bruce* 2247; Warner Mts., *L. S. Smith* 55; Parker Creek, Modoc Co., *Ferris & Duthie* 65; Castle Peak, *Sonne* 6598; White Mts., *Purpus* 5796. Ore.: Redmond, Deschutes Co., *Whited* 99. In the North Coast Ranges we find certain plants resembling A. beckwithii and hesitantly note them as follows: Mt. Eddy, *Heller* 13,434; South Yollo Bolly, *Jepson* 13,342.

Refs.—ARABIS BECKWITHII Wats. Proc. Am. Acad. 22:467 (1887), type loc. Quartz Mts., n. Nev., *Beckwith* 22, the first cited collection. The second ("Carson City, *Watson*") and third ("Candelaria, *Shockley*") collections cited by Watson we include in the species, excluding "San Bernardino Mountains, *Parish Brothers* 1302". *A. subpinnatifida* var. *beckwithii* Jepson, Man. 431 (1925).

16. **A. rectissima** Greene. RECTOR'S CRESS. Stems 1 to several, simple, arising from the crown of a biennial root, 1¼ to 3 feet high; herbage a little glaucous, pubescent below with simple or forked hairs or subglabrous and the leaves merely ciliate; blades of basal leaves oblanceolate to obovate, contracted below to a winged petiole, ¾ to 1½ inches long; blades of cauline leaves linear or oblong-lanceolate, sessile-auriculate, ½ to 1¼ inches long; corolla white or pinkish-white, 2 to 3 lines long; pods straight or very slightly curved, secund, deflexed or typically rather closely reflexed, 2¼ to 3 inches long; pedicels glabrous, 3 lines long; seeds broadly winged.

Loose soil on mountain slopes or open forest floors, 3500 to 9000 (or 11,000) feet: Sierra Nevada from Siskiyou Co. to Tulare Co.; San Bernardino Mts.; San Gabriel Mts. June. See note under no. 12.

Locs.—Black Butte near Mt. Shasta, *Jepson* 59c; Eagle Lake, Lassen Co., *J. Grinnell;* Tahoe, *K. Brandegee;* Nevada Fall, *Jepson* 3139; Yosemite, *Jepson* 10,450; Lamberts Dome, *Mason* 344; Huntington Lake, *Jepson* 12,992, 13,050, 13,078, 13,110; Evolution Basin, *E. Ferguson* 472; Bubbs Creek, Fresno Co., *Jepson* 812; Farewell Gap, *Jepson* 1004; Bear Valley, San Bernardino Mts., *Abrams* 2830; Mt. San Antonio, *Parish* 1970.

Refs.—ARABIS RECTISSIMA Greene, Pitt. 4:191 (1900), type collected by *L. A. R. Peckinpah* in the Sierra Nevada, almost certainly near the Peckinpah Mill, 5600 feet alt., now Madera Co. (formerly Fresno Co.). *A. holboellii* var. *fendleri* Wats.; Gray, Syn. Fl. 1^1:164 (1895) as to California plants; not A. fendleri Greene, Pitt. 3:156 (1897). *A. holboellii* var. *fendleri* Jepson, Man. 429, fig. 416 (1925). Probably *A. duriuscula* Greene, Pitt. 4:191 (1900), type loc. Donner Lake, *Michener.*

A. NEMOPHILA Greene, Lflts. 2:78 (1910), type loc. Sequoia National Forest, *A. Davidson.* Petals white or pinkish; pods straight, extremely narrow, 3 inches long, erect (ex char.).—This may be a form of A. rectissima Greene; or, yet again, it might be A. drummondii Gray.

17. **A. arcuata** Gray. CURLY ROCK-CRESS. Stems usually simple and erect, 1 to 3½ feet high from the simple or branching crown of a perennial root; herbage stellate-pubescent, the leaves stellate-canescent; blades of basal leaves linear-oblanceolate, mostly acute, entire or repand-dentate, 1 to 1½ or 2¼ inches long, the petioles often ciliate; blades of cauline leaves linear to lanceolate, mostly entire; corolla 3 to 5 lines long, mostly dark red; pods commonly curved or sometimes nearly straight, glabrous, 2 to 4 inches long, ¾ to 1½ lines wide, acute, spreading or deflexed on divaricate pubescent or canescent pedicels 2 to 5 lines long.

Mountains, 2500 to 6000 feet: Sierra Nevada from Shasta Co. to Tulare Co.; intermontane and cismontane Southern California. South into Lower California. May-June.

Habit note.—The root-crown or caudex remains simple the first two or three years, after which it develops few to several short persistent woody branches which bear the flowering stems of the season. These stems are usually densely leafy at base. In habit and in most features as well this species is most closely related to A. perennans Wats.

Locs.—Sierra Nevada: Horse Mt., Shasta Co., *J. T. Howell* 2311 (pedicels subglabrous); Folsom, *Alice King;* Snow Creek, Mariposa Co., *Jepson* 10,487; Yosemite, *Jepson* 4271; Mariposa, *Congdon;* Huntington Lake, *A. L. Grant* 1060; Dunlap to Millwood, Fresno Co., *Jepson* 2772; Cedar Creek, Sequoia Park, *Jepson* 600; Kaweah, *Hopping* 381. S. Cal.: Redreef Cañon, Topatopa Mts., *Abrams & McGregor;* Echo Mt., San Gabriel Mts., *Peirson* 62; San Bernardino, *Parish* 4387; Strawberry Valley, Mt. San Jacinto, *Jepson* 1287; Idyllwild-Keen Camp road, *C. V. Meyer* 169; Witch Creek, *Alderson;* Campo, *Abrams* 3563.

Var. **rubicundula** Jepson var. n. Leaves less pubescent; corolla pale pink; pedicels short-pilose.—(Folia minus pubescentia; petala rubicundula; pedicelli breviter pilosi.)—Mt. Day, Santa Clara Co., *R. J. Smith* (type).

Refs.—ARABIS ARCUATA Gray, Proc. Am. Acad. 6:187 (1864). *Streptanthus arcuatus* Nutt.; T. & G. Fl. 1:77 (1838), type loc. high hills, Santa Barbara, *Nuttall. A. holboellii* var. *arcuata* Jepson, Man. 430, fig. 417 (1925). *A. maxima* Greene, Pitt. 4:192 (1900). Var. RUBICUNDULA Jepson.

18. **A. pulchra** Jones. DESERT ROCK-CRESS. Stems one or several from a branching woody crown, erect, commonly simple, leafy, 12 to 15 inches high; herbage stellate-canescent or -pubescent throughout; blades of lower leaves narrow-oblanceolate, gradually contracted below to a petiole, the whole 1 to 2¾ inches long, blades of the upper leaves linear-lanceolate, sessile; raceme not very dense; flowers usually large, soon spreading or reflexed; petals 4 to 6 lines long, rose-color, about twice as long as the pubescent sepals; ovary usually densely woolly; pods pendent, finely pubescent or glabrate, 1½ to 2⅜ inches long, 1½ lines wide, on deflexed pedicels 4 to 7 lines long; stigma sessile; valves longitudinally veined on either side of the midnerve; seeds small, in 2 rows, orbicular, narrowly winged.

Dry soil or slate rocks, 2000 to 5500 feet: desert slopes of mountains on the western borders of the Mohave and Colorado deserts; desert ranges; east side of the Sierra Nevada. East to Utah. Mar.-May.

Tax. note.—There is a gross similarity in habit between the flowering stages of Arabis pulchra and Arabis arcuata. In A. pulchra, however, the pedicels are usually deflexed from the beginning and the ovaries white-tomentulose; in A. arcuata the pedicels are commonly divaricate and the ovaries commonly glabrous or at most only partially puberulent. It is thus possible to distinguish provisionally the two species without the presence of fruits. The ranges of these two species meet, but are mutually exclusive, A. pulchra being of the deserts, A. arcuata being chiefly of the Arid Transition Zone in cismontane California.

Locs.—Jacumba, *Abrams* 3643; Cushenbury Cañon, *Parish* 2323; Hesperia, *Parish* 2323a; Acton, *Hasse;* Lancaster, *Davidson;* Fairmont, Antelope Valley, *Dudley & Lamb;* Mt. Pinos, *Abrams & McGregor* 202; Ft. Tejon, *Parish* 1969; San Emigdio Cañon, Kern Co., *Davy* 2016; Oak Cañon, Tehachapi Mts., *Dudley* 425; Walker Pass (e. slope), *Abrams* 11,936; Granite Wells, *Parish* 10,116; Panamint Range (Contrib. U. S. Nat. Herb. 4:61); Alabama Hills, Owens Lake, *S. W. Austin* 434; Silver Cañon, White Mts., *Heller* 8191; Tinnemaha Creek, Inyo Co., *Almeda Nordyke.* Nev.: Truckee Pass, Virginia Mts., Washoe Co., *Kennedy* 2055; Currant, Nye Co., *Georgia H. Bentley;* Pyramid Lake, *Kennedy* 1986; Fallon, Churchill Co., *Blanche Ross* 19.

Var. **viridis** Jepson var. n. Herbage puberulent but dark green; petals bright purple, 4 to 4½ lines long; pods glabrous or nearly so.—(Herbae puberulae, atrovirides; petala luculento-purpurea, lin. 4–4½ longa; siliquae glabrae vel glabratae.)—Dry or rocky soil, 1500 to 4000 feet, eastern San Diego Co.: summit of Mountain Springs grade, *Jepson* 11,810 (type); Box Cañon, between Blair Valley and Mason Valley, *Jepson* 8702.

Refs.—ARABIS PULCHRA Jones; Wats. Proc. Am. Acad. 22:468 (1887), who cites specimens from w. Nevada, *Stretch, Shockley, Jones,* and San Bernardino and San Diego Cos., *Vasey, S. B. & W. F. Parish, W. G. Wright;* Jepson, Man. 431 (1925). M. E. Jones first recognized and named this species and indicated (in herb.) as the type his specimens (*Jones* 3764) from Empire City, Ormsby Co., Nev., June 19, 1882. *A. beckwithii* Wats. Proc. Am. Acad. 22:467 (1887), as to *Parish* 1302, Cushenbury Sprs., Mohave Desert. Var. VIRIDIS Jepson.

19. **A. perennans** Wats. NEVADA ROCK-CRESS. Stems several, erect from a usually branching and somewhat woody crown, 1 to 1½ feet high; herbage stellate-canescent, or stellate-puberulent and greenish, or glabrous above; leaves entire; basal leaves in dense tufts, the blades of these and the lower cauline narrow-oblanceolate, gradually contracted below to a commonly short petiole, the whole ½ to 1½ inches long; blades of cauline leaves linear to lanceolate, sessile, auricled or not auricled; racemes rather loose; corolla pink, 3 to 3½ lines long; ovary glabrous or nearly so; pods slightly curved or sometimes straight, 1 to 2 inches long, ¾ to 1 line wide, glabrous to thinly puberulent, widely spreading or recurved on pedicels 3 to 9 lines long; pedicels glabrous to puberulent; seeds in 1 or 2 rows, orbicular, narrowly margined.

Rocky slopes in the deserts, 2000 to 5000 feet: eastern Mohave Desert. East to Utah and Arizona. Mar.-Apr.

Tax. note.—In writing the diagnosis of A. perennans Wats. the author has, in contrast to A. arcuata Gray, restricted the conception to the narrow-leaved canescent or subcanescent plants with the shorter type of pods (about 1 to 2 inches long), geographically absorbing only plants of the deserts or desert slopes of the bordering ranges, and purposely excluding plants from cismontane California which have pods 4 inches long or more. All specimens cited have pods which are only slightly curved or are sometimes quite straight. We have thus far met no specimens of A. perennans without question collected in cismontane Southern California.

Locs.—Ord Mt., Mohave Desert, *Jepson* 5884; Bonanza King Mine, Providence Mts., *Munz* 4625; Hanaupah Cañon, Panamint Range, *Jepson* 7053.

Var. **longipes** Jepson comb. n. Stems 2 to several, 7 to 14 (or 16) inches high, from the loosely branched crown of a perennial root, hairy-pubescent below, glabrous above; blades of basal leaves obovate to oblanceolate, dentate, drawn down to a petiole at base, thinly pubescent, the whole ½ to 1½ inches long; blades of cauline leaves oblanceolate or the upper ones oblong to lanceolate, sessile; petals 3 lines long, the purple blade very narrow; pods glabrous, 1¼ to 2½ inches long, spreading on very slender glabrous pedicels ¼ to 1 inch long; seeds in one row.—Rocky slopes of cañons, 1800 to 5000 feet: mountains on west border of Colorado Desert; ranges of the eastern Mohave Desert and of Inyo Co. East to Arizona. Mar.

Tax. note.—On account of its general habit and similarity in inflorescence and pods this form, var. longipes, is too closely related to A. perennans Wats. to secure specific rank. It is commonly distinguished by the broader often coarsely toothed leaves of the basal tufts and by the thread-like pedicels. Its pods are short as compared with those of A. arcuata. The flowers are rather smaller than those of A. pulchra and the petal limbs are narrow.

Locs.—Box Cañon, Blair Valley, e. San Diego Co., *Jepson* 8649; Coyote Cañon, Santa Rosa Mts., *Jepson* 1454; Providence Mts., *T. Brandegee;* Barnwell, New York Mts., *K. Brandegee;* Hanaupah Cañon, Panamint Range, *Jepson* 7092 (dwarf of rock cliffs).

Refs.—ARABIS PERENNANS Wats. Proc. Am. Acad. 22:467 (1887), type loc. n. Nevada, the first station cited; Jepson, Man. 431 (1925). Var. LONGIPES Jepson. *A. arcuata* var. *longipes* Wats.; Gray, Syn. Fl. 1^1:164 (1895), type loc. Fort Mohave, Ariz., *Lemmon.* *A. gracilipes* Greene, Pitt. 4:193 (1900), type loc. Flagstaff, Ariz.; Jepson, Man. 431 (1925).

20. **A. suffrutescens** Wats. PURPLE ROCK-CRESS. Stems several, 7 to 14 inches high, from a branching woody caudex; herbage glabrous, or the basal leaves sparsely ciliate; blades of basal leaves oblanceolate, of the cauline lanceolate, the lower

scarcely auriculate; flowers few; petals purplish, 3 lines long; pods linear, very acute or attenuate-acute at apex, 1½ to 2 inches long, 1½ to 3 lines broad, pendulous on pedicels 4 to 9 lines long; valves 1-nerved, veined; seeds in 2 rows.

Dry or stony situations, 5500 to 6500 feet: east or north of the Sierra Nevada crest from Nevada Co. to Siskiyou Co. North to Washington. Rarely collected in California.

Locs.—Truckee, *Sonne* 9; Shackelford Creek, w. Siskiyou Co., *Butler* 1705.

Refs.—ARABIS SUFFRUTESCENS Wats. Proc. Am. Acad. 17:362 (1882), type loc. Snake River, Union Co., Ore., *Cusick;* Jepson, Man. 432 (1925).

21. **A. glaucovalvula** Jones. MESA ROCK-CRESS. Stems several from a branching woody crown, branched above, 7 to 14 inches high; herbage canescent; leaves mostly basal, these with blades oblanceolate, entire, and gradually narrowed to a petiole, the whole 1 to 2½ inches long, the cauline few, their blades linear to lanceolate, reduced and sessile; flowers rather large, purple, in one-sided racemes; sepals ovate, woolly-pubescent with scarious margins; pods deflexed, glabrous, glaucous, narrow-oblong, rounded at each end, 1-nerved and veiny, 1¼ to 1⅝ inches long, ¼ inch wide, on pedicels 2 to 4 lines long; style stout and rather prominent; seeds in 2 rows with broad membranous wings, 2 lines broad.

Gravelly mesas, 2200 to 5000 feet: eastern Mohave Desert; Inyo Co. East to Nevada. Mar.

Locs.—Shay's Well, w. of Warren's Well, *Jepson* 5958; Cima, *K. Brandegee;* McGee Mdws., Bishop, Inyo Co., *K. Brandegee.* Nevada: Fallon, *Blanche Ross* 28.

Refs.—ARABIS GLAUCOVALVULA Jones, Contrib. W. Bot. 8:40 (1898), type loc. Darwin Mesa, Argus Mts., *Jones;* Jepson, Man. 432, fig. 419 (1925).

22. **A. nardina** Greene. CAÑON ROCK-CRESS. Stems several from the branched root-crown, erect, 5 to 10 inches high, canescent; leaves mostly in a basal tuft, hoary-canescent, the blades linear-oblanceolate, acute or acutish, 4 to 6 lines long, gradually narrowed to a petiole half as long to rather longer; blades of cauline leaves linear to narrow-oblanceolate, sessile; pedicels 1½ to 4 lines long; pods straight or a little curved, ascending, 1¾ to 2¾ inches long, 1½ lines wide; seeds broadly winged.

Flats in desert cañons, 2000 to 3000 feet: south side of Mohave Desert; Panamint Range. Apr.

Locs.—North slope San Bernardino Mts., *Parish* 1300; Cactus Flat, Cushenbury Cañon, *Jones.*

Refs.—ARABIS NARDINA Greene, Lflts. 2:70 (1910), type loc. Mill Creek, Panamint Range, *Coville & Funston* 776; the label on the type spm., no. 776 (U. S. Nat. Herb.), reads "Mill Creek", whereas the record for no. 776 in Contrib. U. S. Nat. Herb. 4:250 is Willow Creek. *A. juniperina* Jones, Contrib. W. Bot. 15:68 (1929), type loc. Cactus Flat, Cushenbury Cañon, San Bernardino Mts., *Jones.*

ARABIS DISPAR Jones, Contrib. W. Bot. 8:41 (1898), type loc. Pleasant Cañon, Panamint Range, *Jones;* habit and leaves apparently similar to A. nardina Greene; "pods 3 inches long, ¾ line wide; seeds not margined."

23. **A. platysperma** Gray. PIONEER ROCK-CRESS. (Fig. 138.) Stems erect or ascending from a slender branching root-crown, 2¼ to 12 inches high; herbage glaucous, finely pubescent or hispidulous or sometimes glabrous; blades of basal leaves oblanceolate, narrowed to a short petiole, ¾ to 1¼ inches long, the upper leaf-blades oblong- to linear-lanceolate, sessile; petals at first white, changing to rose-color, 2 to 3 lines long, the sepals ½ to nearly as long, glabrous, or hispid towards apex; pods erect or a little spreading, 1 to 2 inches long, 1½ to 2 lines broad, tipped with a short stout style; valves distinctly veined, 1-nerved toward the base; seeds in one row, orbicular, winged all around (or nearly so) with a broad scarious membrane.

High montane slopes, often a pioneer on granite sand areas, 7000 to 13,000 feet: inner North Coast Range; Sierra Nevada from Siskiyou Co. to Tulare Co.; San Gabriel Mts.; San Bernardino Mts. June.

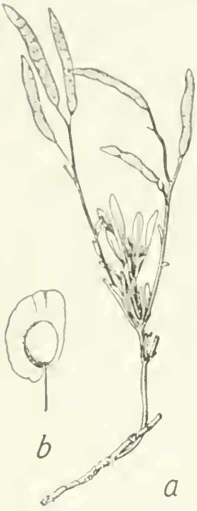

Fig. 138. ARABIS PLATYSPERMA Gray. *a*, habit, × ⅓; *b*, seed, × 2.

Locs.—North Coast Ranges: Mt. Hull, Lake Co. Sierra Nevada: Horse Camp, Mt. Shasta, *Jepson* 59b; Medicine Lake, Siskiyou Co., *M. S. Baker* 484; Mt. Bidwell, *Jepson* 7887; Eagle Peak, Warner Mts., *Jepson* 7973; Silver Lake, Lassen Co., *Baker & Nutting;* Summit sta., Nevada Co., *Jepson* 160a; Truckee River, Placer Co., *Sonne* 416; Mt. Tallac, *Jepson* 8137; Echo Ridge, Eldorado Co., *Ottley* 1170; Silver Lake, Amador Co., *Hansen;* Silver Valley, Alpine Co., *Jepson* 10,151; Sonora Pass, *A. L. Grant* 270; Kaiser Peak, *A. L. Grant* 1049; Wildflower Lake, Kearsarge Pass, *Jepson* 890; Mt. Silliman, *Jepson* 726a; Twin Lakes, *W. Fry* 364; Alta Peak, *Hopping* 217; Mt. Whitney, *Burton & Ryerson* 43. S. Cal.: Ontario Ridge, *Peirson* 58; San Bernardino Mts. (Pl. World 20:216).

Var. **imparata** Jepson var. n. Herbage glabrous; pods larger (3 lines broad), less acute than in the species.—(Herbae glabrae; siliquae majores (lin. 3 latae) quam in specie minus acutae.)—Lake Solfatara, Lassen Peak, *R. M. Austin* in 1896 (type).

Refs.—ARABIS PLATYSPERMA Gray, Proc. Am. Acad. 6:519 (1865), type loc. Mt. Dana, 13,227 ft., and above Ebbets Pass, *Brewer* 1989; Jepson, Man. 432, fig. 420 (1925). *A. covillei* Greene; Fedde, Rep. Nov. Sp. 5:243 (1908), type loc. Mineral King, Tulare Co., *Coville & Funston* 1492, 1515. *A. conferta* Greene, l.c., type loc. headwaters Little Kern River, *Purpus* 5231. *A. oligantha* Greene, l.c., type loc. Dinkey Creek, Fresno Co., *Hall & Chandler* 354. *A. paupercula* Greene, Lflts. 2:77 (1910), type loc. Farewell Gap, Tulare Co., *Purpus* 5229½, the pods "a line wide." *A. howellii* Wats. Proc. Am. Acad. 25:124 (1890), type loc. Ashland Butte, s. Ore., *T. Howell.* The seeds in A. howellii are not in "2 rows" as implied by Watson (Syn. Fl. 1^1:163, sec. 3, and 167). Howell's specimen (the type) is glabrous with the winged petioles of the leaves sparsely ciliate as said by Watson; it is an excellent match for Mt. Shasta, *Pringle*, which we consider good A. platysperma and is so labeled at Gray Herb. (det. S. Watson). A. platysperma shows three forms: (a) herbage puberulent; (b) herbage glabrous save the sparsely ciliate petioles; (c) herbage wholly glabrous. Var. IMPARATA Jepson.

24. **A. inamoena** Greene. PIGMY ROCK-CRESS. Stems scape-like, arising from the dense basal leaf-rosettes of the branched caudex, 1 to 1½ inches high; leaf-blades narrowly linear-oblanceolate, hispid, 2 to 5 lines long, about ½ line wide; pods linear, 10 to 14 lines long, 1 to 2 lines wide (similar to no. 18).

High montane plateaus, southern Sierra Nevada, 8500 to 11,500 feet: western Inyo Co. and eastern Tulare Co. June.

Field note.—This is an interesting dwarf, somewhat resembling an alpine Draba. The large pods are sometimes half the height of the plant. The leaves are persistent for 1 to 3 years in dense whorls below the leaf-rosettes of the season.

Locs.—Coyote Ridge, near South Lake, Inyo Co., acc. Peirson; Rock Creek, Mt. Whitney, *Jepson* 5059; Volcano Mdws., Tulare Co.; Ramshaw Mdws., Kern Peak, *Mary Haskell.*

Var. **acutata** Jepson var. n. Leaves oblanceolate, less densely crowded, glabrous or merely ciliate; pods very acute.—(Folia oblanceolata, minus conferta, glabra ciliatave tantummodo; siliquae acutissimae.)—Young's Lake, Tuolumne Co., 9900 feet, *F. W. Peirson* 7610 (type).

Refs.—ARABIS INAMOENA Greene; Fedde, Rep. Nov. Sp. 5:243 (1908), type loc. Long Mdw., Tulare Co., *Palmer* 192; Jepson, Man. 432 (1925). Var. ACUTATA Jepson.

25. **A. parishii** Wats. DWARF ROCK-CRESS. Stems slender, simple, erect, 1 to 5 inches high, several to many from the densely tufted simple or branched root-crown; herbage finely stellate-pubescent; basal leaves numerous, the blades linear-oblanceolate, entire, 2 to 5 (or 7) lines long, the cauline leaves few (with linear blades), or none; petals rose-color, 3 to 4 lines long, twice as long as the purplish sepals; pods glabrous, 7 to 9 lines long, 1 to 1¼ lines wide, ascending on pedicels 2 to 3 lines long; style filiform, 2 to 2½ lines long; valves 1-nerved and veined; seeds in 1 row, elliptical, narrowly winged.

Mountain slopes, 6500 to 9800 feet: San Bernardino Mts. May, fr. June.

Locs.—Bear Valley, *Parish* 234, 1793, 3751; Sugarloaf Mt., *Peirson* 3101.

Refs.—Arabis parishii Wats. Proc. Am. Acad. 22:468 (1887), type loc. Bear Valley, San Bernardino Mts., *Parish;* Jepson, Man. 433 (1925).

17. **ERYSIMUM** L. Wall Flower.

Erect stoutish biennials or perennials, simple or with few branches. Leaves narrow, entire or dentate. Flowers large, orange to light yellow. Sepals narrow, equal at base or the lateral saccate. Petals with slender claws and obovate limbs. Pod linear, flattened, with 1-nerved valves, or 4-sided. Seeds in 1 row, numerous, not margined.—Species about 90, north temperate zone. (Greek name of a garden plant.)

Stems simple.
  Flowers cream-color or yellowish; pods flattened parallel to the partition; littoral.................... 1. *E. capitatum.*
  Flowers orange; pods 4-sided; mostly interior....................2. *E. asperum.*
Stem profusely branched from the base; flowers yellow; pods thickened; insular......3. *E. insulare.*

1. **E. capitatum** Greene. Dune Wall-flower. Biennial; stem erect, simple (rarely with 1 or 2 branches above), stout, ½ to 1½ (or 3) feet high, leafy; herbage puberulent; leaf-blades narrowly oblong, entire or repand-dentate, gradually contracted to a petiole, the whole 1 to 3 inches long; flowers cream-color to yellowish, rarely white, at first sub-capitate, the axis elongating in fruit and becoming a raceme; pods spreading or divaricate, 1½ to 3½ inches long, 1½ lines wide, abruptly short-pointed; valves flattish, 1-nerved; seeds broadly oblong to orbicular, sometimes with narrow margin.

Bluffs and dunes along the coastline, 1 to 100 feet: Los Angeles Co. to Del Norte Co. North to Puget Sound. Mar.-Apr.

Locs.—Hermosa, Los Angeles Co., *Braunton* 299; Monterey, *Chandler* 352; Bodega Pt., Sonoma Co., *Eastwood;* Humboldt Bay, *Tracy* 2031; Crescent City, *Howell.*

Refs.—Erysimum capitatum Greene, Fl. Fr. 269 (1891), Man. Reg. S. F. Bay 21 (1894); Jepson, Fl. W. Mid. Cal. 218 (1901), ed. 2, 185 (1911), Man. 433 (1925). *Cheiranthus capitatus* Dougl.; Hook. Fl. Bor. Am. 1:38 (1829), type loc. rocky places of the Columbia River near the sea, *Douglas;* Greene, Pitt. 3:131 (1897). *Hesperis menziesii* Hook. Fl. Bor. Am. 1:60 (1830), type from Cal., *Menzies* (cf. Eastwood, Lflts. W. Bot. 1:88,—1934). *E. grandiflorum* Nutt.; T. & G. Fl. 1:96 (1838), type loc. Pt. Pinos, Monterey, *Nuttall. Cheiranthus grandiflorus* Hel. Muhl. 1:145 (1906). *C. asper* C. & S.; B. & W. Bot. Cal. 1:35 (1876), not Nutt. *E. concinnum* Eastw. Zoe 5:103 (1901), type loc. Mendocino, *H. E. Brown* 708. *E. ammophilum* Hel. Muhl. 1:51 (1904), type loc. Seaside, Monterey Co., *Heller* 6650. *Cheirinia ammophila* Hel. l.c. 8:96 (1912).

2. **E. asperum** DC. Western Wall Flower. (Fig. 139.) Biennial or perennial; stem erect, simple, rarely branching above, leafy and with a dense rosette at base (the basal leaves often broader than the upper), 1 to 2½ feet high; herbage strigulose, the hairs often stellately 3-parted; leaf-blades narrowly linear to narrowly oblong (2 to 6 lines wide and 1 to 4 inches long, or the uppermost shorter), entire or sharply dentate, usually drawn down to a slender petiole ⅒ to ⅘ as long; flowers and young fruit ascending; corolla orange, 8 to 10 lines wide; pods 4-sided, ascending or widely spreading, commonly 2 to 4½ inches long, 1 line wide, contracted at apex to a style ½ to 1 line long; seeds oblong, turgid, often slightly winged at one end.

Common on rocky hills and mountains and desert floors, less common in valleys: throughout California. North to Canada, east to Illinois and Texas. Mar.-Apr.

Geog. distribution.—Erysimum asperum is one of the widely distributed species of seed plants in California, occurring in both the Sierra Nevada and Coast Ranges, and also sometimes in the neighborhood of the sea. While it is seen not infrequently on the mesas or on the plains of coastal Southern California, we have never met it on the valley floor proper of the Great Valley. The altitudinal range is also very remarkable, since the species itself occurs from 50 to 9600 feet, while the var. perenne reaches as high as 12,500 feet.

Locs.—S. Cal., 50 to 5000 feet: Laguna Mts., *Peirson;* Del Mar, *Newlon* 297; Saunder Mdw., Mt. San Jacinto, *C. V. Meyer* 170; Santiago Creek, Santa Ana Mts., *Alice King;* Little Green Valley, San Bernardino Mts.; San Dimas, *Chandler;* Mt. Gleason, Los Angeles Co., *Barber* 217; Santa Cruz Isl., *T. Brandegee;* Mission La Purissima, *Jepson* 11,940. Sierra Nevada, 1700 to 9600 feet: Moro Rock, Giant Forest, *Newlon* 16; Kaiser Peak, *Jepson* 13,029; Yosemite Valley, *Bolander;* Hog Ranch (Mather), *A. L. Grant* 979; Hetch Hetchy, *Jepson* 4620; Sonora Pass, *A. L. Grant* 281; Rawhide, Tuolumne Co., *A. L. Grant* 664; Angora Peak to Keiths Dome, *Ottley* 800; Emerald Bay, Lake Tahoe, *J. T. Howell* 1093; Lake City, Modoc Co., *Austin & Bruce.* Marysville Buttes: South Peak, *Jepson* 13,390. Coast Ranges, 50 to 4000 ft.: San Emigdio Cañon, Kern Co., *Davy* 2039; Paso Robles, *Barber;* Orestimba Cañon, w. Stanislaus Co., *Brewer* 1272; Mt. Day, Santa Clara Co., *R. J. Smith;* Antioch, *Davy* 996; Araquipa Hills, w. Solano Co., *Jepson* 13,391; Winneshaw, w. Tehama Co., *Jepson* 178c; Kneeland Prairie, *Tracy* 2636; Trinity Summit, Humboldt Co., *Davy* 5856; Yreka, *Butler* 724.

Var. **bealianum** Jepson var. n. Corolla yellow; fruits broader and shorter.—(Corolla flava; frutex latior et brevior quam specie.)—Desert mesas and ridges, 2000 to 3000 feet: Mohave Desert (Barstow, *Jepson* 5181, type; Daggett, *Mary Beal*).

Var. **perenne** Wats. Perennial; stems more slender, often tufted, 5 to 15 inches high; flowers lemon-yellow; pods thinner, flattened, tapering at apex.—Subalpine, in the Sierra Nevada, 8000 to 12,500 feet, from Mariposa Co. to Tulare Co.

Geog. note.—Var. perenne Wats. is found as high as 12,000 to 12,500 feet on Mt. Whitney. At these higher altitudes it lives to a maximum age of twelve years as evidenced by the annual xylem rings and the constrictions which mark the position of successive terminal winter buds, that is about six times the longevity of the common form of the Sierra Nevada forest at middle altitudes, or of the arid type of the Mohave Desert. It seems likely that the variety perenne is a glacial relic, is in reality the natural type of the species and that the biennial form has been derived from it as an adaptation to drier soils or to milder temperatures.

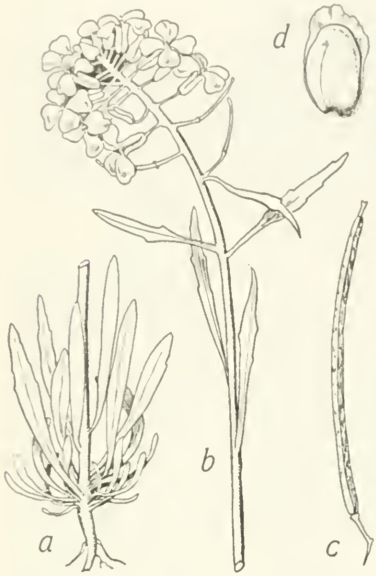

Fig. 139. Erysimum asperum DC. *a*, base of plant, × ⅓; *b*, fl. stem, × ⅓; *c*, pod, × ½; *d*, seed, × 4.

Locs.—Mt. Dana, *Brewer* 1749; Mono Pass, *Jepson* 4464; Kaiser Peak, *A. L. Grant;* Mt. Silliman, *Jepson* 750; Alta Mts., Tulare Co., *Hopping* 146; Mt. Whitney, *Jepson* 1074; Army Pass, *Jepson* 5063; upper Little Kern River, *Purpus* 5219.

Refs.—Erysimum asperum DC. Syst. 2:505 (1821); Hook. Fl. Bor. Am. 1:64, t. 22 (1830); Jepson, Fl. W. Mid. Cal. 218 (1901), ed. 2, 185 (1911), Man. 433 (1925). *Cheiranthus asper* Nutt. Gen. 2:69 (1818), type from plains of the upper Missouri River, *Nuttall. E. californicum* Greene, Erythea 3:69 (1895), type loc. Antioch, *Greene. Cheiranthus californicus* Greene, Pitt. 3:133 (1896). *E. nevadense* Hel. Muhl. 1:52 (1904), type loc. Donner Lake, *Heller* 6956. *Cheirinia nevadensis* Hel. Muhl. 8:96 (1912). Var. bealianum Jepson. Var. perenne Wats.; Cov. Proc. Biol. Soc. Wash. 7:70 (1892), type loc. between Mineral King and Farewell Gap, Tulare Co., *Coville* 1487; Jepson, Man. 433 (1925). *Cheiranthus perennis* Greene, Pitt. 3:132 (1896).

3. **E. insulare** Greene. Island Wallflower. Woody-based plant 1 to 2 feet high; shoots of the season from the woody basal branches of two kinds, fertile shoots and sterile shoots; fertile shoots ¾ to 1½ feet long, leafy throughout, terminated by a dense raceme; sterile shoots 6 to 7 inches long, very densely leafy at the ends, sparingly leafy below; herbage glabrous, or the young parts canescent; leaf-blades narrowly linear, ½ to 1 line wide, 2 to 4½ inches long, somewhat contracted toward the base but scarcely petioled; racemes 1½ to 2 inches long, the pedicels spreading; corolla yellow; pods only slightly thickened, 1¼ to 2 inches long; seeds not margined.

Dunes and sandy slopes, 5 to 500 feet: San Miguel Isl.; Santa Rosa Isl.; Los Angeles coast. June.

Locs.—Santa Rosa Isl., *T. Brandegee;* Playa del Rey, *Parish* 11,881.

Var. **angustatum** Jepson comb. n. Perennial; base of the stem or the short branches of the root-crown densely clothed with narrowly linear leaves, these leaves very much narrower than the cauline leaves; flowers and young fruit horizontally spreading.—Low flats or hill slopes, 5 to 2000 feet: lower San Joaquin River; Arroyo Seco Cañon, San Gabriel Mts., *Peirson* 337. The geographic distribution seems incoherent; the material may, therefore, need another interpretation.

Refs.—ERYSIMUM INSULARE Greene, Bull. Torr. Club 13:218 (1886), type loc. San Miguel Isl., *Greene;* Jepson, Man. 433 (1925). *Cheiranthus insularis* Greene, Pitt. 3:131 (1896). *C. suffrutescens* Abrams, Bull. S. Cal. Acad. 2:41 (1903), type loc. Port Ballona, Los Angeles Co., *Abrams* 2511. Var. ANGUSTATUM Jepson. *Cheiranthus angustatus* Greene, Pitt. 3:132 (1896), type loc. San Joaquin River, San Joaquin Co., *Greene.*

ERYSIMUM REPANDUM L. Amoen. Acad. 3:415 (1756), type European. Annual, branched above; leaf-blades linear-lanceolate, repand-dentate; flowers yellow, 2 to 3 lines long; pods 4-sided, 2½ inches long, rigid, horizontal, spine-like.—Introduced from Europe; troublesome in alfalfa fields, becoming a tumbleweed; sometimes miscalled Russian Thistle: Modoc Co., *Manning* 25.

ERYSIMUM CHEIRANTHOIDES L. Sp. Pl. 661 (1753), type European. Annual; erect, branching above; leaf-blades lanceolate, entire or slightly dentate, short-petioled; flowers pale yellow, 2 lines long; pods 4-sided, ¾ to 1 inch long, ascending on slender spreading pedicels 4 lines long.—Introduced from Europe: adventive along railroad, Placer Co., *Sonne.*

18. MATTHIOLA R. Br.

Stout stellate-tomentose herbs with oblong or linear leaves. Flowers usually purple, sweet-scented; petals with long claws and broad showy limbs. Pod large, linear, nearly terete or compressed; stigmas thickened or horned at the back. —Species 50, Europe and South Africa. (Peter Andrew Matthioli, 1500–1577, Italian physician and celebrated botanist.)

1. **M. incana** R. Br. GARDEN STOCK. Stems erect, branched above, 2 feet high; leaf-blades entire or sinuately dentate, 4 to 7 inches long; flowers ¾ to 1¼ inches broad; pods 2½ to 4⅛ inches long; seeds thin, flat, circular, wing-margined.

Native of Europe; naturalized along the seashore bluffs of San Diego and Orange Cos. Mar.

Locs.—Del Mar, *Newlon* 311; Carlsbad (Bull. S. Cal. Acad. 19^4:18); Oceanside; Aliso Pt., *D. L. Crawford.*

Refs.—MATTHIOLA INCANA R. Br.; Ait. Hort. Kew. ed. 2, 4:119 (1812); Jepson, Man. 434 (1925). *Cheiranthus incanus* L. Sp. Pl. 662 (1753), type loc. seacoast, Spain.

19. PARRYA R. Br.

Perennial herbs, with basal leaves and flowering stems borne on the crown of a simple or branched caudex. Flowers purple or rose-color, the clusters showy. Stigma 2-lobed. Pod very strongly flattened, produced at apex into a prominent acute or attenuate point, the valves 1-nerved. Seeds convex or turgid, in 2 rows in each cell.—Species about 15, alpine or arctic regions of North America and northern Asia. (Capt. W. E. Parry, British navigator, who discovered the first-known species while on quest of the Northwest Passage.)

Pods divaricately spreading; flowering stems 2 to 3 times as long as the leaves.. 1. *P. cheiranthoides.*
Pods ascending; flowering stems scarcely exceeding the leaves..2. *P. eurycarpa.*

1. **P. cheiranthoides** Jepson comb. n. (Fig. 140.) Plants 3 to 6 inches high, the scapose flowering stems and the leaves caespitose on a thick caudex, the caudex simple or with few short branches; leaf-blades spatulate or oblanceolate, acute or obtuse, densely stellate-tomentose, entire, 1 to 3 inches long, drawn down to a petiole at base, ½ to 1½ inches long; racemes many-flowered; pods ensiform, attenuate to the short style, 1 to 1½ inches long, glabrous, 2 to 4-seeded; pedicels 3 to 4 lines long, both the pedicels and the pods spreading horizontally.

Montane, granite detritus, 4000 to 10,700 feet: eastern slope of the Sierra Nevada from Inyo Co. to Modoc Co., west to Siskiyou Co., thence south to Mendocino Co. North to Washington. Western Nevada. June.

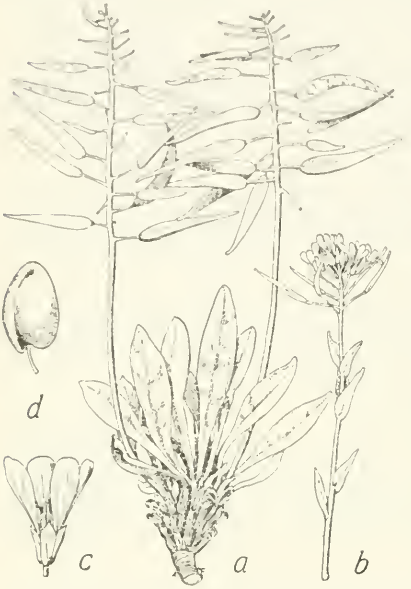

Fig. 140. Parrya cheiranthoides Jepson. *a*, habit, × ½; *b*, infl., × ½; *c*, fl., × 1½; *d*, seed, × 3.

Locs.—Bishop (foothills s.), *Heller* 8293; Sonora Pass, *A. L. Grant* 441; Deer Park, Placer Co., *Helen Geis;* mts. above Truckee River, Placer Co., *Sonne* 20; Castle Peak, Nevada Co., *Heller* 7085; Soupan Sprs., Lassen Peak; Milford, Lassen Co., *M. S. Baker;* Forestdale, Modoc Co., *M. S. Baker;* Jess Valley, Warner Mts., *L. S. Smith* 784; Goose Lake Valley, *R. M. Austin;* Mt. Bidwell, *Jepson* 7879; Yreka, *Butler* 1296; Mt. Sanhedrin, *Purpus* 1075.

Var. **glabra** Jepson comb. n. Plant entirely glabrous.—Warner Mts., Modoc Co.

Refs.—Parrya cheiranthoides Jepson. *Phoenicaulis cheiranthoides* Nutt.; T. & G. Fl. 1: 89 (1838), type loc. Walla Walla River (high hills to the e., probably in Wash.), *Nuttall*. *P. menziesii* Greene, Fl. Fr. 253 (1891); Jepson, Man. 434 (1925). *Hesperis menziesii* H. & A. Bot. Beech. 322, t. 75 (1840). *Cheiranthus menziesii* B. & W. Bot. Cal. 1:35 (1876). *Phoenicaulis menziesii* Greene, Bull. Torr. Club 13:143 (1876). *Arabis menziesii* Nels. Proc. Biol. Soc. Wash. 18:187 (1905). *Parrya menziesii* Greene var. *lanuginosa* Wats.; Gray, Syn. Fl. 1:156 (1895), type loc. e. of Cascades, lower Columbia Valley, Wash., *Douglas*, *Suksdorf*. *Arabis pedicellata* Nels. l.c. 17:91 (1904), type loc. Hunter Creek Cañon, Reno, Nev., *Kennedy & True* 705. *Streptanthus pedicellatus* Nels. l.c. 92. *Phoenicaulis pedicellata* Hel. Muhl. 2:203 (1906). Var. glabra Jepson. *Parrya menziesii* var. *glabra* Jepson, Man. 434 (1925), type loc. Lake City Mt., Modoc Co., *C. C. Bruce* 2250.

2. **P. eurycarpa** Jepson. Plants 1 to 2 inches high, the flowering stems and leaves caespitose on a slender branched caudex; herbage stellate-pubescent; leaf-blades oblanceolate, 4 to 6 lines long; raceme few-flowered; pods oblong-ovate, acute, glabrous, ¾ to 1 inch long, 3 to 5 lines broad; style ½ line long; seeds oval, the seed-coat covered with silvery white, more or less crisped scales or processes.

Subalpine slides or shaly flats, 11,500 to 14,300 feet: Sierra Nevada from Tulare Co. to Tuolumne Co.; White Mts. North to Idaho.

Locs.—Old Mt. Whitney, *Purpus;* Mt. Whitney, *Purpus;* Harrison Pass (Publ. Sierra Club 27:29); White Mountain Peak, *Jepson* 7385; near Sonora Pass.

Refs.—Parrya eurycarpa Jepson, Man. 434 (1925). *Draba eurycarpa* Gray, Proc. Am. Acad. 6:520 (1865), type loc. peak s. of Sonora Pass, *Brewer*. *P. huddelliana* Nels. Bot. Gaz. 54:139 (1912), type loc. Bear Cañon, Custer Co., Idaho, *C. I. Huddle* (*Nelson & Macbride* 1466).

20. **TROPIDOCARPUM** Hook.

Erect or diffusely spreading annuals with pubescent herbage, pinnatifid leaves and leafy racemes of rather small yellow flowers. Sepals concave, ovate-oblong, spreading. Petals cuneate-obovate. Stamens tetradynamous; anthers roundish. Style slender, sometimes short. Pod completely or partially 2-celled, or 1-celled, strongly flattened contrary to the narrow partition, or only the upper part flattened, or somewhat inflated; valves 2 to 4, opening from above; seeds in 2 or 4 rows.—Species 2, California. (Greek tropis, keel, and karpos, fruit, in reference to the carinate valves of the capsule).

Variation in the pod.—The valves in Tropidocarpum gracile may dehisce from above, or sometimes from below, or subequally throughout (Tracy, *Benj. Cobb*). In plants of this same species from Delano, Kern Co. (*D. Steinwand*), the pods show considerable variation in compression: they may be (a) compressed throughout, (b) compressed on lower half and obcompressed on upper half, or (c) they may be somewhat contorted with the compression obscure. Variation similar to this is often met with in T. gracile and is paralleled in T. capparideum Greene. In a field near the Mountain House, eastern Alameda Co. (*Jepson* 15,349), two forms of T. capparideum were found: first, plants of branching habit which bore the inflated-subcylindric type of pod usual to T. capparideum, and also pods compressed below, sometimes obcompressed above; second, strictly erect plants bearing only the type of pods characteristic of typical T. capparideum. Prolonged consideration of T. capparideum seems convincing that it is to be regarded as a sporting or reversionary form of T. gracile and not as a species in the sense that T. gracile is a species. Its features are so remarkable, however, that we retain it here, for the time, as a nominal species.

Plants, when robust, with mostly straggling branches; pods 2-valved and 2-celled......1. *T. gracile.*
Plants commonly erect; pods 4-valved and 1-celled......2. *T. capparideum.*

1. **T. gracile** Hook. DOBIE POD. Stems erect or at last very diffuse, 5 to 14 inches long; leaves pinnatifid, the segments commonly linear, acutish, cleft or entire; basal leaves 1 to 4 inches long, petioled; cauline leaves more or less reduced, subsessile or sessile; pedicels axillary, 3 to 10 lines long, spreading; stamens very unequal; pods linear, strongly obcompressed throughout, tardily dehiscent, 1 to 1½ inches long; seeds in 2 rows.

Valleys and hill slopes, 200 to 2200 feet: plains and low hills on the borders of the Great Valley; South Coast Ranges; Inyo Co. and south through the Mohave Desert to San Diego Co. Mar.-Apr.

Field note.—In the vernal grassland formation Tropidocarpum gracile is a common species, especially in the inner South Coast Range region. While it is infrequent or absent from the more sterile clays it is common on the intermediate clays and frequently it is one of the dominants. On spots of very rich soil it sometimes develops colonies three to twelve feet across. Such colonies are pure and represent a dense and very tangled growth.

Locs.—Salt Creek, w. Tehama Co., *Jepson* 178c; Marysville Buttes, *Jepson* 13,491; Auburn, comm. *W. S. Shockley;* Rio Linda, n. Sacramento Co., *Jepson* 16,595; Salmon Falls, Eldorado Co., *Jepson* 15,752; Kinsley, Mariposa Co., *Charlotte Hoak;* St. Helena, *Clara Hunt;* Corral Hollow, *Jepson* 9567, 9573; Los Buellis Hills, Santa Clara Co., *R. J. Smith;* Stanford, *C. F. Baker* 336; Guadalupe Mine, Santa Clara Co., *Jepson* 9087; Soledad; Little Rabbit Valley, San Benito Co., *Jepson* 16,134; Cholame Valley, se. Monterey Co., *Jepson* 16,183; Santa Margarita, *Jepson* 11,970; Waltham Creek, San Carlos Range, *Jepson* 2691; Madera, *Jepson* 15,156; Sparkville, Fresno Co., *Jepson* 15,141; Goshen; Tulare, *Davy* 3097; Three Rivers, *W. Fry* 150; Independence, *S. W. Austin* 431; Searles, Mohave Desert; Granite Wells, Mohave Desert; Barstow; Redlands, *Parish;* San Jacinto, *Gregory;* San Felipe; San Diego, *Cleveland.*

Var. **dubium** Jepson. Pod 1-celled below, the partition persistent in the upper third or fourth; otherwise like the species.—West side of the San Joaquin Valley and south to coastal Southern California.

Refs.—TROPIDOCARPUM GRACILE Hook. Ic. Pl. t. 43 (1836), type loc. "Monterey", *Douglas;* Jepson, Fl. W. Mid. Mid. Cal. 223 (1901), ed. 2, 189 (1911), Man. 434 (1925). Var. *scabriusculum* Greene, Fl. Fr. 278 (1891). *T. scabriusculum* Hook. Ic. Pl. t. 52 (1836), type loc. "Monterey", *Douglas.* Var. DUBIUM Jepson, Man. 434 (1925). *T. dubium* Dav. Erythea 2:179 (1894), type loc. near Los Angeles, *Davidson;* Jepson, Fl. W. Mid. Cal. 223 (1901), ed. 2, 189 (1911). In neither T. gracile nor T. scabriusculum is the locality "Monterey" recorded on the original specimens in Herb. Hook. (Kew). See note under Thelypodium flavescens Wats.

2. **T. capparideum** Greene. ALKALI POD. Stem stoutish, erect, 8 to 10 inches high, simple or sparingly branched; foliage as in T. gracile, the upper leaves somewhat more deeply parted and with longer subentire segments; pods linear-oblong, 7 to 10 lines long, 2 lines wide, somewhat inflated, 1-celled, conspicuously 6-nerved, tipped with a short style; valves 4, the dehiscence beginning at the apex; seeds in 4 rows.

Alkaline soil, 25 to 500 feet: Mt. Diablo range and bordering plains. Mar.

Locs.—Clayton, *Davy* 1262; Byron, *Greene;* Mountain House, e. Alameda Co., *Jepson* 15,349; Tracy, *Michener & Bioletti.*

Refs.—TROPIDOCARPUM CAPPARIDEUM Greene, Pitt. 1:217 (1888), type loc. eastern Contra Costa Co. near the San Joaquin River, *Greene;* Jepson, Fl. W. Mid. Cal. 223 (1901), ed. 2, 189 (1911), Man. 435 (1925).

21. LYROCARPA Hook. & Harv.

Erect herbs, ours perennial, with somewhat flexuous branches and stellate pubescence. Leaves toothed or runcinately pinnatifid. Sepals linear-oblong, sharply acute, strongly connivent. Petals in ours linear-elongated. Style short or none. Stigma very large. Pod in ours obcordate or fiddle-shaped, flattened contrary to the narrow partition.—Species 2, California and Mexico. (Greek lyra, a lyre, and carpos, fruit).

1. **L. coulteri** Hook. & Harv. Stems several, woody at base, 1½ to 3 feet high; flowers in a loose raceme, maturing slowly, sweet-scented; sepals stellate-tomentose, strongly connivent near or above the middle, becoming distinct from below; petals tawny yellow, lance-linear, 6 to 8 lines long, tapering to a long slender claw; pods 3 to 6 lines long; seeds 2 to several in each cell, round, flat.

Sandy flats, 500 to 1500 feet: western Colorado Desert. South to Lower California and Sonora, east to Arizona. Mar.-Apr.

Locs.—Borrego Spr., *Purpus;* San Felipe Narrows, *Jepson* 12,532; Sentenac Valley, *Jepson* 8781; Vallecito, *Jepson* 8548.

Refs.—LYROCARPA COULTERI Hook. & Harv. Lond. Jour. Bot. 4:76, t. 4 (1845), the type from Cal., collected by *Coulter;* B. & W. Bot. Cal. 1:44 (1876); Jepson, Man. 435, fig. 421 (1925).

22. LESQUERELLA Wats.

Low herbs, ours stellate-pubescent throughout. Flowers usually yellow. Style slender; stigma entire or nearly so. Pod globose-inflated to obovate; cells 2 to 15-seeded; seeds flattened; cotyledons accumbent.—Species about 35, one in South America, the remainder in North America. (Leo Lesquereux, distinguished American paleobotanist and bryologist, 1805–1889.)

Annual; basal leaves not forming a rosette; flowers 2 to 3 lines long; pods globose, glabrous or puberulent; style a little shorter than the pod; pedicels curved.....................1. *L. palmeri.*
Perennial; basal leaves in a rosette; style equaling or slightly longer than the pod; pedicels straight or straightish.
  Pods globose or subglobose, thinly pubescent; flowers yellow, 3 to 5½ lines long.....2. *L. kingii.*
  Pods flattened on the margins, ovate, densely pubescent; flowers deep yellow, 4 lines long...... 3. *L. occidentalis.*

1. **L. palmeri** Wats. Stems one or few from the base, slender, ascending or mostly erect, 4 to 12 inches high; leaf-blades oblong-oblanceolate or linear, mostly acute, 3 to 12 lines long, narrowed to a slender petiole or the upper subsessile; pedicels ascending, horizontal or recurved, usually sigmoid; ovules 4 to 6 in each cell; pods globose, 1½ lines in diameter.

Desert hills, 500 to 5000 feet: eastern Mohave Desert; northeastern Colorado Desert. East to Arizona and south to Lower California. Mar.-Apr.

Locs.—New York Mts., *J. Grinnell;* Bonanza, Providence Mts., *Munz & Harwood* 3444; Goffs, *Parish* 9647; Fenner, *Newlon* 532; Cañon Sprs., Colorado Desert; Salvation Sprs., Colorado Desert.

Refs.—LESQUERELLA PALMERI Wats. Proc. Am. Acad. 23:255 (1888), based on spms. by *Palmer* (cult. from Arizona seed) and *Orcutt* (Topo Cañon, L. Cal.); Jepson, Man. 435 (1925).

2. **L. kingii** Wats. Stems ascending or decumbent, 2 to 7 inches long; blades of basal leaves suborbicular to elliptic, entire or 1 to 3-dentate on each side, 3 to 9 lines long, drawn down to a petiole 1 to 1½ times as long; blades of cauline leaves oblanceolate; pods 2 to 3 lines in diameter, the cells 2 to 4-ovuled.

Mountain ranges bordering or lying within the desert interior, 5000 to 8000 feet: San Bernardino Mts.; east side of the Sierra Nevada (or its northern crests) from Inyo Co. to Modoc Co. May-June.

Locs.—Bear Lake, San Bernardino Mts., *Peirson* 4600; Telescope Peak, *Jepson* 7022; Campito Mt., White Mts., *Jepson* 7335; Silver Cañon, White Mts., *Jepson* 7335a; upper Squaw Valley, Truckee River, *Sonne;* Lassen Peak, *Jepson* 4093; Lake City Mt., Modoc Co., *C. C. Bruce* 2136.

Refs.—LESQUERELLA KINGII Wats. Proc. Am. Acad. 23:251 (1888); Cov. Contrib. U. S. Nat. Herb. 4:62 (1893); Gray, Syn. Fl. 1¹:117 (1895); Jepson, Man. 435 (1925). *Vesicaria kingii* Wats. l.c. 20:353 (1885), based on spms. from the West Humboldt Mts., Nev., *Watson* 82, and Lassen Peak, Cal., *Lemmon, R. M. Austin. L. palmeri* Parish, Bot. Gaz. 65: 337 (1918) as to Bear Valley plants.

3. **L. occidentalis** Wats. Stems erect or ascending, 3 to 9 inches high, from the crown of a stout taproot; leaves entire; blades of the basal leaves orbicular to elliptic, varying to oblanceolate, ½ to 1¼ inches long, narrowed to petioles 1½ to 2 times as long, blades of the cauline spatulate; pods somewhat flattened, ovate, acutish, 2 to 4 lines long; cells 4-ovuled.

Easterly or northerly sides of the Sierra Nevada from Placer Co. to Siskiyou Co., thence south to Lake Co., 5500 to 7500 feet: north to Oregon. Apr.-May.

Locs.—Squaw Valley, Truckee River, *Sonne;* Mt. Eddy, Siskiyou Co., *Alexander & Kellogg* 331; Cherry Creek, Siskiyou Co., *Butler* 588; Greenhorn Mt., Siskiyou Co., *Butler* 1342; Marble Mt., *Jepson* 2835; Snow Mt., Lake Co.

Refs.—LESQUERELLA OCCIDENTALIS Wats. Proc. Am. Acad. 23:251 (1888); Jepson, Man. 435 (1925). *Vesicaria occidentalis* Wats. l.c. 20:353 (1885), based on spms. from Yreka, Cal., *Greene,* Multnomah Co., Ore., *Howell,* and White Bluffs, Columbia River, Wash., *T. Brandegee.*

23. DITHYRAEA Harv.

Ours an annual herb with finely pubescent herbage. Sepals stellate-tomentose, connivent above, forming a closed tube. Petals white or tinged with purple, conspicuous, broadly spatulate, with spreading limbs and slender claws. Stamens 6; anthers linear, sagittate. Pods strongly obcompressed and didymous, that is notched both above and below, the lobes suborbicular, with a distinct cord-like margin. Style almost none, crowned by a large helmet-shaped stigma.—Species 3, southwestern United States and Mexico. (Greek, dis, two, and thureos, shield, referring to the flattened twin fruit.)

1. **D. californica** Harv. SPECTACLE POD. Stems several from the base, spreading or ascending, 4 to 18 inches high, very brittle at the joints; leaf-blades thickish, ovate or oblong-ovate, shallowly and somewhat sinuately few-toothed, 1 to 2 inches long, the basal on petioles nearly as long, the cauline nearly sessile and somewhat cuneate at base; racemes very dense; flowers sweet-scented, 4 to 5 lines long, on pedicels scarcely 1 line long; fruit with a tomentose-margined border, 3 to 4 lines broad.

Sandy soil in the deserts, 300 to 4000 feet: Inyo Co.; Mohave and Colorado deserts. South to Mexico and east to Nevada. Mar.-Apr.

Locs.—Inyo Co.: Olancha; Keeler. Mohave Desert: Needles, *Parish* 9603; Coolgardie, *Jepson* 6633; Lancaster, Los Angeles Co., *Davy* 2277; Barstow, *Jepson* 5356; Stoddard Well, *Jepson* 5900. Colorado Desert: Palm Sprs., Mt. San Jacinto, *Parish* 4107; Borrego Spr., *Jepson* 8875; San Felipe Narrows, *C. V. Meyer* 48; Blair Valley, e. San Diego Co., *Jepson* 8674; Vallecito, *Jepson* 8912; Coyote Wells, *Newlon* 411; Indian Wells, *Newlon* 423; Holtville, *Jepson* 11,716.

Var. **maritima** Dav. Leaf-blades mostly orbicular, sinuate to entire, thicker, distinctly fleshy, more densely canescent-tomentose; racemes very dense; pods more densely pubescent.—Coast sand dunes from Los Angeles Co. to San Luis Obispo Co.

Locs.—Hermosa Beach, Los Angeles Co., *Braunton* 285; Playa del Rey, *Braunton;* Surf, Santa Barbara Co.; Oso Flaco Lake, San Luis Obispo Co., *W. S. Cooper* 167.

Refs.—DITHYRAEA CALIFORNICA Harv.; Hook. Lond. Jour. Bot. 4:77, t. 5 (1845), type from Cal., *Thos. Coulter* 37; Jepson, Man. 436, fig. 422 (1925). *Biscutella californica* B. & W. Bot. Cal. 1:48 (1876). Var. MARITIMA Dav.; Rob. in Gray, Syn. Fl. 1¹:123 (1895). *Biscutella californica* var. *maritima* Dav. Erythea 2:179 (1894), type loc. Redondo, *Alice J. Merritt. D. maritima* Dav.; Dav. & Mox. Fl. S. Cal. 151 (1923).

24. THLASPI L.

Herbs with undivided leaves, the cauline ones auriculate-clasping. Flowers in ours white. Sepals short, oval, obtuse. Petals obovate or oblanceolate. Anthers short, oval. Pod obcompressed, in ours cuneate, obovate or orbicular, the valves often winged, especially towards the apex. Seeds 2 or several in each cell; cotyledons accumbent.—Species about 60, North America, Europe, Africa, Asia. (Greek thlan, to crush, on account of the strongly flattened pods.)

Perennial; pod obovate; seed smooth..................1. *T. alpestre.*
Annual; pod orbicular; seed rugose..................2. *T. arvense.*

1. **T. alpestre** L. Mountain Penny Cress. Stems commonly many from a branching perennial crown, 3 to 8 inches high; leaves mostly in a basal tuft, the blades of these round-obovate to oblanceolate, 3 to 6 lines long, narrowed to slender petioles 1 to 2 times as long, the blades of the cauline ovate to oblong, sessile-auriculate; raceme rather dense; flowers white, 2 to 3 lines long; petals rather spreading, twice the length of the sepals; pods narrowly obovate or cuneate, 3 to 4 lines long, twice as long as wide, retuse or truncate at apex, flattened toward the margin, the summit narrowly winged; style slender, ½ to nearly 1 line long.

Northern mountains, 5000 to 7000 feet: Humboldt, Trinity and Siskiyou Cos., east to Plumas Co. North to British Columbia; New Mexico to Montana. Europe, Asia. Apr.-May.

Locs.—Spanish Peak; Forest House Mt., Siskiyou Co., *Butler* 119; Marble Mt., *Jepson* 2842; Dorleska, Trinity Co. The usual form passes into the var. **californicum** Jepson. Four to 12 inches high; raceme looser; pods truncate to retuse at apex.—Humboldt Co.: Hupa, *Chandler* 1377; Supply Creek, *Davy & Blasdale* 5736; Kneeland Prairie, *Tracy* 4043.

Refs.—Thlaspi alpestre L. Sp. Pl. ed. 2, 2:903 (1763), type European; Jepson, Man. 437, fig. 423a (1925). Var. californicum Jepson, Man. 437, fig. 423b-d (1925). *T. californicum* Wats. Proc. Am. Acad. 17:365 (1882), type loc. Kneeland Prairie, Humboldt Co., *Rattan*. *T. glaucum* Nels. Bull. Torr. Club 25:275 (1898), type loc. Battle Lake, Wyo., *Nelson* 4176. *T. alpestre* var. *glaucum* Nels. First Report on Fl. Wyo. 84 (1896). *T. glaucum* var. *hesperium* Payson, Univ. Wyo. Publ. Sci. Bot. 1:154 (1926), type loc. Dorleska, Trinity Co., *Hall* 8570.

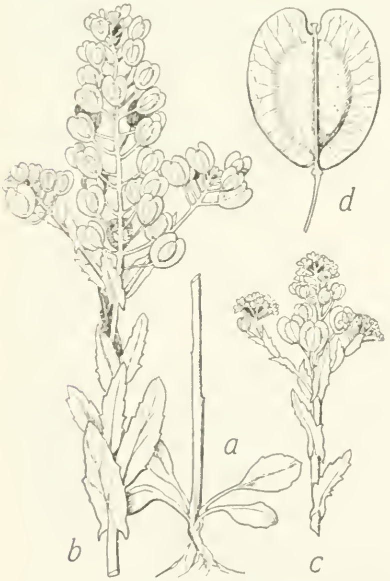

Fig. 141. Thlaspi arvense L. a, base of plant, × ⅓; *b*, upper part of plant, × ⅓; *c*, infl., × ⅓; *d*, pod, × 1⅓.

2. **T. arvense** L. Field Penny Cress. (Fig. 141.) Annual, erect, 8 to 14 inches high, often branched above; leaves ½ to 2 inches long, rather remotely toothed, the blades of the basal spatulate, those of the cauline oblong, obtuse; flowers smaller than in T. alpestre and with narrower petals; pods orbicular or nearly so, ½ inch in diameter, strongly obcompressed, broadly winged, the apex deeply notched; style very short.

Introduced from Europe, adventive in Modoc Co. and Los Angeles Co. Also called French Weed.

Locs.—Adin, *J. L. Chace;* Alturas, *L. S. Smith* 1092; Henniger Flats, San Gabriel Mts., *Peirson* 66, in 1918.

Refs.—Thlaspi arvense L. Sp. Pl. 646 (1753), type European; Britt. & Br. Ill. Fl. 2:114, fig. 1692 (1897); Jepson, Man. 437 (1925).

25. **CORONOPUS** Ludwig

Prostrate annuals (exhaling a heavy-scented odor), with pinnatifid leaves and short racemes of minute greenish-white flowers. Sepals oval, spreading. Stamens 6, or often only 4 or 2. Pod small, more or less didymous, flattened contrary to the narrow partition, the surface strongly wrinkled or tuberculate; valves of the pod falling away at maturity from the persistent axis as closed or nearly closed nutlets. Cotyledons incumbent.—Species 12, all continents but mostly subtropic regions. (Greek korono, crow, and pous, foot, because of the shape of the leaves.)

1. **C. didymus** Sm. Wart Cress. Stems numerous, freely branching, diffuse or prostrate, ½ to 2 feet long; leaves ½ to 1 inch long, pinnately parted into entire or sharply toothed segments; pods small, about 1 line broad, notched both above and below, thus appearing transversely 2-lobed or didymous, each lobe turgid and finely wrinkled.

South American weed, naturalized near dwellings, 5 to 1200 feet: cismontane. May.

Locs.—Pasadena and Los Angeles (acc. Davidson & Moxley, Fl. S. Cal. 153); San Francisco, *Davy;* Berkeley, *Jepson* 12,046; Montezuma Hills, Solano Co., *Jepson* 13,356; Drytown, Amador Co., *Hansen;* Healdsburg, *Alice King;* Dyerville, Humboldt Co., *Jepson* 16,431; Hydesville, Humboldt Co., *Tracy* 1234; Manning Creek, lower Van Duzen River, *M. S. Baker* 91.

Refs.—CORONOPUS DIDYMUS Sm. Fl. Brit. 2:691 (1800); Jepson, Fl. W. Mid. Cal. 229 (1901), ed. 2, 193 (1911); Man. 437 (1925). *Lepidium didymum* L. Mant. 92 (1767), type European. *Senebiera didyma* Pers. Syn. 2:185 (1807). *S. pinnatifida* DC. Mem. Soc. Hist. Nat. Paris 1:144 (1799).

C. PROCUMBENS Gilib. Fl. Lithuan. 2:52 (1781); Jepson, Man. 437 (1925). *C. ruellii* All. Fl. Pedem. 1:256 (1785); Jepson, Fl. W. Mid. Cal. 229 (1901), ed. 2, 194 (1911). *Cochlearia coronopus* L. Sp. Pl. 648 (1753), type European. Swine-cress. Fruit notched above, obscurely didymous, strongly roughened and cristate-muricate.—Adventive at San Francisco.

Ionopsidium acaule Rchb. Fl. Germ. 7:26, t. 649 (1829). *Cochlearia acaulis* Desf. Fl. Atlant. 2:69 (1800), type loc. Portugal. Annual, 2 to 2½ inches high; stem short, rather densely leafy, each axil bearing a long naked one-flowered peduncle; leaf-blades ovate, entire, 2 lines long, long-petioled; pods obcompressed, flattened, round-ovate, 2 lines long.—Adventive at Ferndale, Humboldt Co. (*J. P. Tracy, R. D. Douglas*); native of Portugal.

26. LEPIDIUM L. Pepper-grass

Low annuals, rarely perennials, with toothed or pinnatifid leaves and very small flowers (½ to 1 or 2 lines long). Petals white, rarely yellow, sometimes none. Stamens 6, 4 or 2. Pod an orbicular, ovate or broadly oblong silicle, strongly obcompressed, and commonly notched or lobed at the more or less winged apex; valves acutely carinate, the cells 1-seeded. Style, if present, persistent in fruit. Cotyledons incumbent or accumbent.—About 123 species, widely distributed, chiefly in temperate and subtropic regions. (Greek lepidion, a little scale, in reference to the flattened pods.)

A. Style distinctly developed and persistent.

Racemes racemose (that is, not capitate); plants erect or nearly so.
Pods not winged nor notched at apex.
Pods flat, dehiscent; leaves linear-lanceolate, merely sessile; flower-glands distinct.......... 1. *L. jaredii.*
Pods inflated, indehiscent; leaves ovate to ovate-lanceolate, auriculate-clasping at base; flower with an annular gland.......... 2. *L. draba.*
Pods winged and notched at apex.
Cauline leaves clasping; herbage pubescent or grayish.
Pods thick, winged all around; blades of upper leaves oblong, sagittate-clasping at base, denticulate.......... 3. *L. campestre.*
Pods thin, minutely winged at apex only; blades of upper leaves cordate-clasping at base, entire.......... 4. *L. perfoliatum.*
Cauline leaves not clasping; species of the deserts or arid regions.
Herbage minutely puberulent or short-hirsute; biennial.......... 5. *L. montanum.*
Herbage glabrous; perennial.
Stems herbaceous; pods oval.......... 6. *L. alyssoides.*
Low woody bush; pods obcordate.......... 7. *L. fremontii.*

Racemes subcapitate in the leaf axils and forks; corolla bright yellow; plant prostrate.................. 8. *L. flavum.*

B. Style none, the stigma sessile or subsessile; corolla white or none; annuals.

1. *Pods notched but not winged.*

Pedicels terete or only slightly flattened.
  Margin of pods not scaberulous.
    Plants erect; leaf-blades narrowly ovate to lanceolate, oblanceolate or linear, pinnatifid to serrate or entire; sepals deciduous.
      Petals present; cotyledons accumbent..9. *L. virginicum.*
      Petals minute or none; cotyledons incumbent.................................10. *L. densiflorum.*
    Plants prostrate or diffuse; blades of leaves bipinnatifid or those of the upper pinnately parted; petals setaceous, minute; sepals persistent, rarely deciduous...... 11. *L. pubescens.*
  Margin of pods scaberulous; blades of leaves once or twice pinnately parted, the ultimate segments mostly ovate or oblong; petals none; sepals deciduous, rarely persistent; coastal S. Cal., rare..12. *L. robinsonii.*
Pedicels very much flattened.
  Herbage hirsutulose; petals minute or none; pods pubescent, at least on the margins.............. 13. *L. lasiocarpum.*
  Herbage glabrous or sparingly pubescent; petals present; pods glabrous.........14. *L. nitidum.*

2. *Pods winged at apex with two lobes or teeth.*

Pods conspicuously reticulated; dwarfs with mostly prostrate or decumbent stems; wings or teeth approximate or parallel.
  Wings nearly as long as the body..15. *L. latipes.*
  Wings very short..16. *L. dictyotum.*
Pods with finer reticulations; teeth divergent.
  Raceme rather dense, with ascending pedicels...17. *L. acutidens.*
  Raceme open, with horizontally spreading pedicels..18. *L. oxycarpum.*

1. **L. jaredii** Bdg. Carrizo Pepper. Annual; stem slender, freely branching, erect, 1½ to 2½ feet high; herbage glaucous, glabrous or puberulent; leaf-blades linear-lanceolate, entire or somewhat toothed, 1½ to 4½ inches long, sessile; racemes in flower dense, soon rather loose; pedicels filiform, 3 to 5 lines long; petals white; pods elliptic or nearly orbicular, obtuse, wingless, glabrous, 1¼ lines long; style ¼ line long.

Washes or valley flats, 200 to 1500 feet: eastern San Luis Obispo Co.; western Fresno Co. Apr., fr. May.

Field note.—About two miles north of Cantua Creek on the plain of the San Joaquin Valley, just north of the Coalinga Hills (oil fields), a broad surface wash comes down from the foothills of the San Carlos Range, a few miles westerly. This sandy wash, underlain by adobe, now supports (April, 1935) a rank growth of Phacelia tanacetifolia, Lepidium nitidum, Monolopia gracilipes, Streptanthus inflatus, Amsinckia vernicosa and a bushy very floriferous annual about two feet high with white flowers which proves to be Lepidium jaredii, uncollected for perhaps 32 years. Individuals of this crucifer are scattered over an area of ten acres. Brought home to the laboratory the petals turn yellowish, which change would account for the color noted in the original description.—Jepson Field Book, vol. 54, p. 106 (ms).

Refs.—Lepidium jaredii Bdg. Zoe 4:398 (1894), based on spms. from Goodwin, San Luis Obispo Co., *Jared*, and Riverdale, Fresno Co., *A. Eaton;* Jepson, Man. 438 (1925).

2. **L. draba** L. Hoary Cress. Stems several from deep-seated perennial roots, 12 to 16 inches high, leafy below, branching above and bearing a corymbose panicle of racemes; herbage grayish-puberulent; leaf-blades ovate to oblong, sagittate-clasping at base and with scattered minute or sometimes salient teeth on the margin, 1 to 2½ inches long; blades of the basal leaves attenuate to slender petioles; petals white; pedicels mostly horizontally spreading; pods somewhat cordate, neither winged nor notched at apex, glabrous, 1 to 1½ lines long, broader than long.

Valley flats, 5 to 2700 feet, garden plant, naturalized from Europe: Coast Ranges to coastal Southern California. Apr.-May.

Locs.—At first occasional in the San Francisco Bay region (Oak Knoll, Napa Valley, *Jepson* 13,398 in 1893; Menlo Park, *John T. Doyle* in 1901) and in coastal Southern California (Ventura Co., acc. Cal. Com. Hort. Mo. Bull. 8:79; Chino and Huntington Beach, acc. Bull. S. Cal. Acad. 19^4:17; Pomona, *Munz* 6914; Santa Ana, *E. Johnson*), in later years it became established as a dangerous weed in Santa Cruz Co. (Watsonville, *C. C. Way*, where known as "Hell Weed" and "Italian Horse Radish") and thoroughly naturalized in Siskiyou Co. as a serious agricultural pest (Yreka, *W. L. Kleaver* in 1915, *Butler* 725). In the last decade it has continued steadily to spread. In moist fields in the south end of the Santa Clara Valley near Gilroy it forms dense colonies 5 to 30 feet wide, which at a little distance resemble patches of white-flowered Umbelliferae persistent after cultivation. It recurs at intervals on the Bolsa towards Hollister (*Jepson* 16,114 in 1932) and is very abundant in valley fields in the region of Paicines (*Jepson* 15,414 in 1930). In 1932 it was observed in fields about Los Banos, western Stanislaus Co.; also near Firebaugh, Fresno Co. (*Jepson* 16,248); and again near San Gregorio, San Mateo Co. (*E. K. Crum*).

Var. **repens** Thell. Pods orbicular to rhomboidal, obtuse or acute at base, glabrous, 2 to 2¼ lines long.—Native of Asia, naturalized at scattered stations: Chino, San Bernardino Valley, *Johnston* 1849 in 1918; Westminster, Orange Co., *E. Johnson* in 1931; Aromas, Monterey Co., *Hickman* in 1923; San Joaquin Co., *Bellue & Mahoney* in 1932.

Refs.—LEPIDIUM DRABA L. Sp. Pl. 645 (1753), type European; Jepson, Fl. W. Mid. Cal. 226 (1901), ed. 2, 192 (1911), Man. 438 (1925). Var. REPENS Thell. Mitteil. Bot. Mus. Univ. Zürich 28:89 (1906). *Physolepidion repens* Schr. Enum. Pl. Nov. 97 (1841), type from India. *L. repens* Boiss. Fl. Orient. 1:356 (1867).

3. **L. campestre** R. Br. POOR-MAN'S PEPPER. Annual or biennial; stems 1 or several from the base, simple, erect, very leafy up to the inflorescence, 9 to 14 inches high; herbage hoary-pubescent; blades of cauline leaves oblong, mostly sagittate-clasping, denticulate, crowded, 1 to 3½ inches long; blades of basal leaves pinnately lobed, long-petioled; pedicels horizontally spreading, equaling or a little shorter than the pods; petals white; pods broadly ovate, thick, squamulose, winged all around, 2½ lines long; style scarcely exserted from the narrow notch at apex.

European species, locally established in the Lake Tahoe region.

Locs.—Deer Park Inn, Placer Co., *H. A. Walker* 2027; Donner Lake, *K. Brandegee*.

Refs.—LEPIDIUM CAMPESTRE R. Br.; Ait. f. Hort. Kew. ed. 2, 4:88 (1812), type European; Jepson, Man. 438 (1925).

4. **L. perfoliatum** L. SHIELD CRESS. Annual; stem erect and simple, or diffusely branching, 1 to 2 feet high; lower leaves petioled, their blades finely bipinnatifid with linear lobes ¼ to 4 lines long; blades of upper leaves round-ovate, cordate-clasping, entire; pedicels spreading; petals yellow; capsule rhombic-orbicular, minutely notched.

Introduced from Europe, sparingly but widely naturalized.

Locs.—Orange, *R. H. Holland;* Hollywood (Bull. S. Cal. Acad. 19^4:17); Redman, w. Mohave Desert, *Ralph Hoffman;* Firebaugh, Fresno Co., *Jepson* 16,252; Hollister; Summit Rock, Santa Cruz Mts., *Pendleton* 947; Sonoma, *R. Kuhn;* Truckee River at Lake Tahoe, *Helen Geis* 199; Yreka, *L. T. Dempster* 1003. Nev.: Carson City, *K. Brandegee.*

Refs.—LEPIDIUM PERFOLIATUM L. Sp. Pl. 643 (1753), type from the Orient; Parish, Bull. S. Cal. Acad. 14:14 (1915); Jepson, Man. 438 (1925).

5. **L. montanum** Nutt. BRONCO PEPPER. Biennial; stem corymbosely branching above or rarely from the base, 10 to 14 inches high; herbage minutely puberulent to shortly hirsute; blades of leaves pinnately incised or parted, ¾ to 1¾ inches long, the segments ovate to oblong or linear, sometimes again incisely cleft or toothed, ½ to 2 or 3 lines long; blades of upper leaves toothed or rarely entire; flowers in dense racemes; petals white; pods elliptic, varying to ovatish or orbicular, obscurely or slightly notched at apex, 1 to 1½ lines long, on spreading pedicels twice as long.

Mountain valleys, 2500 to 5000 feet: Siskiyou Co.; rare in California. North to Oregon, east to Colorado, Arizona and Texas. Apr.

Locs.—Grenada, Siskiyou Co., *Heller* 8068; Pit River s. of Alturas, *R. M. Austin* (herbage slightly puberulent or subglabrous).

Refs.—LEPIDIUM MONTANUM Nutt.; T. & G. Fl. 1:116 (1838), type loc. plains of the Rocky Mountains, on the western side, to the borders of the Columbia River, *Nuttall;* Jepson, Man. 438 (1925).

6. **L. alyssoides** Gray. MESA PEPPER. (Fig. 142.) Stems several from a perennial base; herbage glabrous; leaves ½ to 1 or 1½ inches long, the blades of the basal and lower ones pinnately parted into 5 to 11 oblong or oval incised or entire lobes about 1 to 2 lines long, the blades of the cauline pinnately incised or toothed or entire; racemes dense; petals white; fruiting pedicels 2 to 3 lines long; pods oval, 1 line long.

Plains and mesas, 2000 to 5000 feet: eastern Mohave Desert. North to Nevada, east to Colorado and Texas. May.

Locs.—New York Mts., *J. Grinnell.* Steamboat Sprs., Nev., *Sonne;* Las Vegas, Nev., *K. Brandegee.*

Tax. note.—The assertion is made by M. E. Jones (Zoe 4:266) that L. alyssoides Gray is only a more enduring form of L. montanum Nutt. The two, it would seem, are very closely allied. A. Thellung, who accepts L. scopulorum Jones, L. vaseyanum Thell., L. integrifolium Nutt. and L. fremontii Wats. as well as L. alyssoides Gray and L. montanum Nutt., admits that he has "den Speziesbegriff etwas enger gefasst als in den meisten übrigen Teilen meiner Arbeit" (Gatt. Lepidium 209). He had, however, no field acquaintance with these plants, and it is to be said that wider and more intensive field studies and collections must be made in the Great Basin before a satisfying investigation of these particular forms can be concluded.

Refs.—LEPIDIUM ALYSSOIDES Gray, Mem. Am. Acad. 4:10 (1849), type based on specimens from Santa Fe eastward to Rabbit's Ear Creek, N. Mex., *Fendler;* Jepson, Man. 439 (1925). *L. montanum* var. *alyssoides* Jones, Zoe 4:266 (1893).

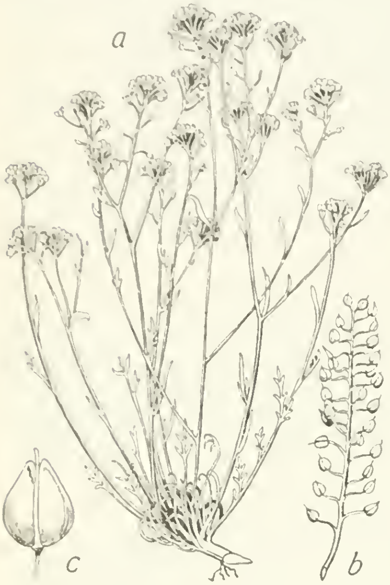

Fig. 142. LEPIDIUM ALYSSOIDES Gray. *a*, habit, × ½; *b*, fr. branchlet, × ½; *c*, pod, × 4.

7. **L. fremontii** Wats. EXPLORERS PEPPER. Rounded low evergreen bush, the stems woody below, ¾ to 2 feet high; herbage glabrous and glaucous; leaf-blades narrow, linear, acute, 1 to 2 inches long, entire or with 1 or 2 pairs of linear salient lobes or teeth; racemes very numerous; flowers on slender spreading pedicels; petals white, 1½ to 2 lines long; pods thin, light-colored, shallowly obcordate with broad rounded lobes, rounded or often pointed at the base, 3 lines long.

Arid rocky slopes, rocky mesas or washes, 500 to 3200 feet: Colorado Desert, north side; abundant in the Mohave Desert; north to Inyo Co. East to Colorado. Jan.-May.

Locs.—Laws, Inyo Co., *Heller* 8310; Slate Range, *Jepson;* Granite Wells, *Parish* 9790; Hanaupah Cañon, Panamint Range, *Jepson* 6949; Funeral Mts., *Jepson;* Randsburg, *Heller* 7679a; Lanfair, *Maye L. Tennent;* Box S Sprs., n. foot San Bernardino Mts., *Wieslander;* Hesperia, *Jepson* 6145; Barstow, *Jepson* 4786, 5434; Rosamond, Antelope Valley, *Davy* 2241; Little Rock Creek, *Peirson* 677; Cottonwood Spr., Riverside Co., *Jepson* 12,562; Shavers Well, *J. T. Howell* 3305; Hayfields, Chuckwalla Mts., *Schellenger.* Fallon, Nev., *Blanche Ross* 42.

Refs.—LEPIDIUM FREMONTII Wats. Bot. King 30, pl. 4, ff. 3, 4 (1871), type loc. Mohave River, *Fremont;* Jepson, Man. 438, fig. 424 (1925).

8. **L. flavum** Torr. YELLOW PEPPER-GRASS. Prostrate or decumbent annual, 4 to 16 inches broad, very brittle at the joints; herbage glabrous, yellow-green; leaves slightly fleshy, the basal rosulate, their blades oblong-oblanceolate in outline, regularly pinnatifid with short rounded lobes and narrow acute sinuses, the blades of the cauline oblanceolate to obovate, pinnatifid, sparingly toothed or entire;

racemes short and dense, subcapitate, in the leafy axils or in the forks; petals bright yellow; pods glabrous, finely reticulated, bifid at the apex, the teeth acute, the sinus open; style half as long as the body of the pod.

Sandy bottoms of desert washes or dry pool beds, 1000 to 4100 feet: Mohave Desert; Inyo Co. Nevada to Mexico. Fl. Mar.-Apr.; fr. May.

Locs.—Victorville, *Newlon* 475; Rabbit Sprs., *Jepson* 5944; Barstow, *Jepson* 5398, 6602; 6625; Kramer, *Jepson* 5345; Lancaster, *Parry;* Rosamond, Antelope Valley, *Davy* 2264; Mohave, *Parry;* Owens Lake (s. of), *S. W. Austin* 52; Laws, *Heller* 8181. Fallon, Nev., *Blanche Ross.*

Var. **apterum** Henr. & Thell. Leaf-blades narrowly obovate, serrately cleft; pods not notched at apex or only slightly or obscurely.—Desert flats and valleys, Colorado Desert: San Felipe, *T. Brandegee;* Ironwood Well (= Yaqui Well), *T. Brandegee.*

Refs.—LEPIDIUM FLAVUM Torr. Pac. R. Rep. 4:67 (1857), type loc. sandy places near Mohave Creek, *Fremont;* Jepson, Man. 439 (1925). *Sprengeria flava* Greene, Lflts. 1:198 (1905). *S. watsoniana* Greene, l.c. 199, type loc. Humboldt Lake, Nev., *Watson* 126. *S. minuscula* Greene, l.c. type loc. Shepherd Cañon, Argus Mts., Inyo Co., *Coville & Funston* 734. Var. APTERUM Henr. & Thell.; Mededell. Rijks Herb. Utrecht 34:1 (1918), type loc. Kramer, *Heller.*

9. **L. virginicum** L. BIRDS PEPPER. Stem erect, ¾ to 2 feet high, simple below, paniculately branching above and bearing many racemes 2 to 8 inches long, rarely with several stems from the base; herbage glabrous to sparingly pubescent; blades of basal and lower leaves narrowly ovate to oblanceolate, irregularly pinnatifid or sharply serrate, 1 to 2¼ (or 3) inches long, narrowed at base to a petiole 1 to 3 inches long; blades of cauline leaves oblanceolate or linear, serrate only towards the apex or entire, more rarely pinnately cleft, shorter, shortly petioled or mostly sessile; petals white; stamens 2; pods orbicular or nearly so, glabrous, 1½ lines long, slightly notched at the very narrowly winged apex; pedicels 1½ to 2 lines long, widely (or even horizontally) spreading.

Moist valleys and stream bottoms, 20 to 4800 feet: throughout California. East to the Atlantic. Feb.-Nov.

Locs.—Olinda, Shasta Co., *Blankinship;* Beckwith Pass, *Jepson* 7763; Blue Cañon, Placer Co., *H. A. Walker* 1205; Scott Valley, Lake Co., *Jepson* 13,400; Healdsburg, *Alice King;* Ft. Bragg, *W. C. Mathews;* St. Helena, *Jepson* 13,399; Rough & Ready Isl., lower San Joaquin River, *Berg;* Pescadero, *T. Brandegee;* Cottonwood Creek, White Mts., *Duran;* Santa Barbara, *S. H. Faunt le Roy;* Mt. Wilson, *Peirson* 298; Arroyo Seco (hills w.), Los Angeles, *Peirson* 2357; Pasadena, *Geo. B. Grant;* San Bernardino Mts., *Hall* (cots. incumbent, tending to be accumbent); Santiago Creek, Anaheim, *Alice King;* Coyote Cañon, Santa Rosa Mts., *Jepson* 1457; Palomar, *Jepson* 1512; Mission San Luis Rey, *Jepson* 8479; Lakeside, San Diego Co., *T. Brandegee.*

The species passes into the var. **pubescens** Thell. Stout, 9 to 12 inches high; herbage hispidulous; pods a little larger, "glabrous" or puberulent.—Desert regions: Providence Mts., *T. Brandegee;* Santa Rosa Mts. (Thellung, Gatt. Lepidium 230). East to New Mexico.

Refs.—LEPIDIUM VIRGINICUM L. Sp. Pl. 645 (1753), type loc. Virginia; Jepson, Man. 439, fig. 426 (1925). *L. intermedium* B. & W. Bot. Cal. 1:47 (1876); Greene, Fl. Fr. 275 (1891). *L. medium* Jepson, Fl. W. Mid. Cal. 227 (1901), ed. 2, 192 (1911), and other Cal. authors. *L. bernardinum* Abrams, Bull. Torr. Club 37:149 (1910), type loc. Bear Valley, San Bernardino Mts., *Abrams* 2826. Var. PUBESCENS Thell. Mitteil. Bot. Mus. Univ. Zürich 28:230 (1906). *L. intermedium* var. *pubescens* Greene, Bot. Gaz. 6:157 (1881), type loc. Mangos Sprs., N. Mex., *Greene.* *L. medium* var. *pubescens* Rob.; Gray, Syn. Fl. 1^1:127 (1895). *L. hirsutum* Rydb. Bull. Torr. Club 39:312 (1912).

10. **L. densiflorum** Schrad. MINERS PEPPER. Similar to L. virginicum; herbage puberulent to almost glabrate; blades of cauline leaves oblanceolate to linear, entire or sparingly serrate (often only towards apex), ¾ to 1¼ inches long; blades of basal leaves pinnately divided or cleft or merely toothed; racemes more slender, often denser; petals none or minute; stamens 2; pods glabrous, sometimes puberulent.

Valley floors, desert mesas and cañon flats, (500 or) 2000 to 6500 feet: arid region south, east and north of the Sierra Nevada from the Mohave Desert to Siskiyou Co.; infrequent on the west slope of the Sierra Nevada or in cismontane California. East to Texas and New Jersey, north to Canada. Apr-May, fr. June-Aug.

Tax. note.—This plant differs in so small a degree from L. virginicum that by the present writer it was disposed as a variety of that species in the Manual of the Flowering Plants of California. It is, in our judgment, a nicely doubtful case as to status, though most authors receive it as a species, usually without comment. The lack of corolla is not especially significant, since this organ may sometimes be present in a reduced state; and in the related Lepidium divergens Osterh. the petals may, likewise, be present or absent.

Locs.—Potrero, San Diego, *Cleveland;* Escondido, *C. V. Meyer* 90; Barstow, *Jepson* 6623; Kessler Peak, Ivanpah Mts., *Jepson* 15,819; Wells Ranch, Inyo Co., *Kennedy;* Silver Cañon, White Mts., *Jepson* 7231; Mono Lake, *Ottley* 1056; Yosemite, *Jepson* 10,477; Big Valley, Lassen Co., *Baker & Nutting;* Jarnigan, Humboldt Co., *Chesnut & Drew;* Yreka Creek, *Butler* 130, 1612.

Refs.—LEPIDIUM DENSIFLORUM Schrad. Ind. Sem. Goett. 4 (1832), based on a garden plant in the Goettingen garden. *L. virginicum* var. *californicum* Jepson, Man. 439 (1925), type loc. Barstow, Mohave Desert, *Jepson* 6623.

11. **L. pubescens** Desv. WAYSIDE PEPPER-GRASS. Stems several from the base, branching, diffuse or prostrate, 3 to 6 inches long, the plants often closely matting the ground; herbage light green, puberulent; blades of leaves pinnately divided or parted, ½ to 2 inches long, the segments linear and entire, or commonly 3-toothed or 3-cleft, 1 to 3 lines long; racemes many, dense (often with the pods imbricated), and rather narrow, the pedicels shorter than the pods, ascending, ½ line long; petals setaceous, minute, white; silicles elliptic, 1¼ lines long, glabrous, faintly reticulate, the teeth at the apex short and obtuse, the sinus v-shaped.

Common in hard beaten soil, by paths and waysides, 5 to 1500 feet; Coast Ranges from Humboldt Co. to San Luis Obispo Co.; northern Sacramento Valley and south to the northern borders of the San Joaquin Valley; Sierra Nevada foothills. Naturalized from Chile. Mar.-Apr.

Flower note.—This species has often been described as lacking petals. In reality there are petals present; they are setaceous, minute, and may have been mistaken for filaments. The fertile stamens are 2, but 4 sterile filaments also occur. The sepals are more or less white-margined.

Note on origin.—In his monograph, Die Gattung Lepidium, Thellung regards our plant (L. menziesii and L. bipinnatifidum of Cal. authors) as conspecific with L. pubescens Desv. and we here accept his view. He raises, however, the query as to whether this species may not have arisen independently in both the Californian and Chilean areas. In our view no problem exists on that hypothesis. The species, as it occurs in California, is certainly an introduction, undoubtedly from South America. It has all the habits and peculiarities of an introduced plant, an argument already well expressed by Greene in Erythea (1:181). It was evidently introduced in the central coast region in the 1870s. It is noticed in the Botany of the California Geological Survey (1876) from one station only (Placerville) as a var. strictum Wats. of L. oxycarpum.

The earliest collections known to us are as follows: San Francisco, *Vasey* in 1875; Hupa Valley, *Rattan* in 1878; live oaks of the Mokelumne River, *Rattan* in 1878; Petaluma, *Congdon* 300 in 1880. While thus introduced so long ago it does not appear to occur in Southern California even at the present day.

Locs.—Coast Ranges: Hydesville, Humboldt Co., *Tracy* 3276; Round Valley, Mendocino Co., *Westerman;* Calistoga, *Jepson* 13,361; Denverton, Solano Co., *Jepson* 13,358; Bolinas, *Chesnut & Drew;* Olema, *H. A. Walker* 1172; Mt. Diablo, *Chandler* 942; Berkeley, *Davy* 4233; San Francisco, *Kellogg;* San Bruno, San Mateo Co., *Jepson* 13,362; Coyote Creek, Santa Clara Co., *Chandler* 924a; Estrella, San Luis Obispo Co., *Jared.* Great Valley: Redding, *Blankinship;* Greasewood Hills, w. Tehama Co., *Jepson* 13,359; Marysville Buttes, *Jepson* 13,360; Sacramento, *Bolander;* Waverley, San Joaquin Co., *Sanford.* Sierra Nevada foothills: Ione, *Jepson* 15,211; Copperopolis, Calaveras Co., *Davy* 1329; Rattlesnake Gulch, e. of Friant, *Jepson* 15,119.

Refs.—LEPIDIUM PUBESCENS Desv. Jour. Bot. 3:165, 180 (1814), type loc. Peru, *Dombey.* *L. menziesii* Greene, Fl. Fr. 275 (1891), Man. Reg. S. F. Bay 24 (1894). *L. bipinnatifidum* K. Bdg. Zoe 3:49 (1893), 4:300 (1894); Rob. in Gray, Syn. Fl. 1^1:128 (1895); Jepson, Fl. W. Mid. Cal. 227 (1901), ed. 2, 192 (1911), Man. 439, fig. 425 (1925). *L. strictum* Rattan, Anal. Key 25 (1888); Jepson, Fl. W. Mid. Cal. ll. cc. *L. oxycarpum* var. *strictum* Wats. Bot. Cal. 1:76 (1876), type loc. Placerville, *Rattan.*

L. reticulatum Howell, Fl. Nw. Am. 64 (1897). Greene in Pitt. 3:156 (1897) identifies this with the plant well-known to California authors, by some called L. bipinnatifidum (K. Brandegee, Zoe 4:300), by others L. menziesii (Greene, Erythea 1:181). Thellung (Gatt. Lepidium 253) takes up the name L. reticulatum and quotes as a synonym the name L. bipinnatifidum as used by North American authors (Gray, Brandegee). One of the collections which he cites (*Parish* 1187, San Bernardino) is, however, L. densiflorum. As we have indicated above Thellung also (l.c. 249) extends the species L. pubescens of Chile to California; he cites (amongst other collections) *Jones* 3272 (San Francisco) which is L. bipinnatifidum of California authors and quotes as a synonym L. strictum Rattan, which is L. bipinnatifidum of California authors likewise. Without much doubt L. reticulatum Howell should be considered a synonym of. L. pubescens Desv.

12. **L. robinsonii** Thell. FRIENDS PEPPER-GRASS. Stems several to many from the base, ascending or diffuse, 3 to 10 inches long, or the stem one, erect, with few branches above the base; stems hirsutulose with spreading hairs, the leaves scantily hirsutulose or puberulent or subglabrous; leaves ½ to 1¼ inches long, bipinnately divided, the lobes discrete, oblong, elliptic or obovate, ½ to 5 lines long; racemes only slightly open, 2 to 3½ inches long, usually taking up a lateral position through dominance of the axillary shoot, thus apparently standing opposite the leaves; pedicels about 1 line long, spreading nearly horizontally, a little curved; petals none; pods suborbicular, glabrous (the margin scaberulous), 1¼ lines long, the notch at apex shallow, v-shaped.

Valley flats or mesas, 5 to 1500 feet: coastal Southern California; apparently a rare plant. Feb.-Mar.

Tax. note.—The peduncles of the racemes are commonly not leafy. In some cases the racemes are incipient from near the base. The ultimate segments of the leaves are broadest at the middle, mostly contracted at base and tend to be obtusish or rounded at apex, though sometimes acute; sometimes a pinna is noticeably trefoil-shaped, sometimes on a single leaf the segments are conspicuously unequal. In L. pubescens, with which this may be confused, the ultimate segments are narrower, not so conspicuously contracted at base or not at all, commonly very acute at apex, and usually less unequal.

Locs.—San Bernardino, *Parish;* Riverside, *C. M. Wilder* 1121; Ramona, *K. Brandegee* (an excellent match for an isotype of the species); San Diego, *Cleveland & Parry.*

Refs.—LEPIDIUM ROBINSONII Thell. Mitteil. Bot. Mus. Zürich 28:255 (1906), type loc. San Diego, *Jones* 3050; Jepson, Man. 439 (1925). *L. menziesii* B. & W. Bot. Cal. 1:46 (1876), at least as to *Brewer* 27 (Los Angeles), and probably as to *Palmer* 7 (Guadalupe Isl.).

13. **L. lasiocarpum** Nutt. SAND PEPPER-GRASS. Stems several to many from the base, decumbent or ascending, 3 to 6 (or 10) inches long, or the single stem erect and branching a little above the base; herbage hirsutulose or hirsute; leaf-blades obovate to oblanceolate, toothed, incised or less commonly pinnatifid; racemes many; pedicels distinctly flattened, horizontally spreading, 1½ lines long; sepals broadly oblong, usually purple, with thin white margins; petals minute or none; pods suborbicular, thin-margined near the apex, commonly hispid-pubescent on the margin, hispid-pubescent on the faces or subglabrous; notch at apex of pod shallow, angular or short-linear; seeds narrowly wing-margined except on the side opposite the cotyledons.

Sandy flats or valleys, 20 to 2900 feet: coast of Southern California; through the Colorado and Mohave deserts to Inyo Co. East to Nevada and Texas, and south into Mexico. Mar.-Apr

Locs.—San Clemente Isl., *Peirson* 3448 (stems densely hispidulose); Santa Rosa Isl., *T. Brandegee;* Hueneme, Ventura Co., *Peirson* 5771; San Diego, *Cleveland;* Coyote Wells, Colorado Desert, *Jepson* 11,757; Vallecito, *Jepson* 8568; Yaqui Well, *Jepson* 12,512; San Felipe Narrows, *C. V. Meyer* 29; San Felipe Valley, *Jepson* 8737; Borrego Spr., *Jepson* 8890; Indian Cañon, Collins Valley, *Jepson* 8828; Heber, Imperial Co., *Abrams* 3148; Rockwood, Imperial Co., *Parish* 8296; Chuckwalla Mts.; Needles, *Parish* 9632; Barnwell, *K. Brandegee;* Cima, San Bernardino Co., *K. Brandegee;* Rabbit Sprs., *Parish* 9826; Fremont Peak; Hanaupah Cañon, Panamint Range, *Jepson* 7051; Silver Cañon, White Mts., *Heller* 8215. Tonopah, Nev., *Shockley* 80; Fallon, Churchill Co., Nev., *Blanche Ross* 18.

Refs.—LEPIDIUM LASIOCARPUM Nutt.; T. & G. Fl. 1:115 (1838), type loc. Santa Barbara, *Nuttall;* Jepson, Man. 440 (1925).

14. **L. nitidum** Nutt. COMMON PEPPER-GRASS. CALIFORNIA TONGUE-GRASS. stem branching from or near the base, 1 to 16 inches high, the branches mostly simple; herbage glabrous or sparingly pubescent; leaves ½ to 4 inches long, the blades pinnatifid with the rachis ligulate and bearing entire or laciniately toothed discrete lobes, the terminal lanceolate lobe often enlarged or prolonged; upper leaves often with nearly or quite entire blades, the uppermost often entire; petals

white, obovate, without distinct claw, ¾ line long; stamens 6, but the 2 shorter mere rudiments; pods circular, with a narrow margin, abruptly notched at apex, 1½ to 2 lines long, plane on the upper face, convex on the lower, glabrous and shining, often dark purple.

Open plains, valley floors and low hills, 10 to 2200 (or 3000) feet: common everywhere in the cismontane region, occasional in the deserts. North to Washington; south to Lower California. Feb.-Apr.

Associated species.—While individuals of Lepidium nitidum are most commonly associated with plants of other species of the early vernal flora in open ground (such as Lomatium carnifolium, Brodiaea capitata, Capsella bursa-pastoris, Calandrinia caulescens var. menziesii, Medicago denticulata, and various species of Lupinus, Amsinckia and Plagiobothrys), sometimes, as on the low hills of the inner North Coast Ranges, this Lepidium may also occur in pure colonies a few yards square, colonies which can be picked out by the eye in grassy fields as spots of color due to the reddish-brown pods. In the South Coast Ranges, especially in the inner range, it is one of the more important and most frequent annuals of the grassland formation, often being one of the dominants and coloring the hills reddish-brown in March. On the plain of the lower Cholame Valley it reaches a high development in size and forms a dense and almost pure growth 10 to 12 inches high over an area four miles long by two miles wide. Biologically this region may be regarded as the center of its distribution. Over California generally it is the most widely distributed and most common species of its genus, though it is uncommon in and doubtless not indigenous to the desert region.

Locs.—Humboldt Bay, *Tracy* 4927; Anderson, *Blankinship* (an intergrade to var. insigne); Marysville, *Heller* 7562; Sacramento, *Francis Ramaley;* Ione, *Jepson* 15,208; Round Valley, Mendocino Co., *Westerman;* Calistoga, *J. T. Howell* 1687; Vacaville, *Jepson* 8219; Santa Rosa, *M. S. Baker* 714; Novato, Marin Co., *Jepson* 9061; Mill Valley, Marin Co., *Chandler* 504; San Pablo Valley, *Jepson* 9601; Berkeley, *Jepson* 13,372; Milpitas, *R. J. Smith* 23; Guadalupe Mine, Santa Clara Co., *Jepson* 9090; Corral Hollow, *Jepson* 9586; Arroyo Mocho, *Jepson* 10,678; Waverly, San Joaquin Co., *J. A. Sanford;* Huron, Fresno Co., *C. V. Meyer* 267; Table Mt., Fresno Co., *Jepson* 15,112; Grapevine Spr., Tulare Co., *Woolsey;* Tulare, *Davy* 3051, 3069; Bitterwater Valley, San Benito Co., *Jepson* 16,138; upper Waltham Creek, w. Fresno Co., *Jepson* 16,154; Cholame Valley, e. San Luis Obispo Co., *Jepson* 16,185; Paso Robles, *Barber;* Mohave, *Heller* 7760; Saugus, *Davy;* Los Angeles, *Brewer* 173; San Bernardino, *S. B. & W. F. Parish;* Temescal Mts., *Brewer* 152; Warner Ranch; San Felipe; San Diego.

Var. **insigne** Greene. Pods large (3 lines long).—Foothills: inner South Coast Range (Palo Prieto Pass, e. San Luis Obispo Co., *Jepson* 16,200); Tehachapi Range, *Peirson* 5506.

Refs.—LEPIDIUM NITIDUM Nutt.; T. & G. Fl. 1:116 (1838), type loc. Santa Barbara, *Nuttall;* Jepson, Fl. W. Mid. Cal. 227 (1901), ed. 2, 192 (1911), Man. 440, fig. 427 (1925). Var. INSIGNE Greene, Fl. Fr. 274 (1891), type loc. hills e. side Livermore Valley, *Greene.*

15. **L. latipes** Hook. DWARF PEPPER-GRASS. Stems 1 to several from the base, very thick and stout, 1 to 2 inches long, recurved-prostrate or rarely erect; herbage slightly pubescent; leaves 3 to 5 inches long, their blades linear and entire, or pinnatifid with few segments, the segments remote, lanceolate or linear, often toothed, 3 to 7 lines long, the rachis ligulate, commonly dilated into a terminal lanceolate lobe; racemes very dense and often capitate, ½ to 1¼ inches long; petals broadly spatulate, greenish, rounded at the apex, 1 line long, exceeding the short sepals; pods broadly oblong or oval, 2½ to 3 lines long, 2 lines broad, strongly reticulated, sparingly pubescent or glabrous, winged at apex with two broad acute teeth nearly as long as the body, the sinus between the teeth or wings a narrow cleft.

Alkaline flats, beds of winter pools or balsas on the plains or in the valleys, 10 to 2000 feet: Coast Ranges and Great Valley to coastal Southern California. Mar.-May.

Locs.—Spruce Grove, Humboldt Co., *Tracy* 1644; Round Valley, Mendocino Co., *Westerman;* Thomas Creek, Sanhedrin Mt., *Duran* 1452; Willits, *Davy & Blasdale* 5097; Willows, *Jepson* 13,368; College City, *Alice King;* Vacaville, *Jepson* 13,365; Hass Slough, Solano Co., *Jepson* 13,366; Hass Slough, *Jepson* 13,369 (a remarkable form with long erect stems 11½ inches high); Suisun, *Jepson* 9620; Martinez, *Brewer* 985; Nortonville, *Jepson* 15,720; Donner Cañon, Clayton, *Jepson* 7594; Moraga Valley, *Jepson;* Bolsa e. of Gilroy, *Jepson* 6205; Tres Pinos, San Benito Co., *Jepson* 16,123; Santa Barbara, *Brewer;* Carpinteria, *Brewer* 273; San Diego, *T. Brandegee.*

Refs.—LEPIDIUM LATIPES Hook. Ic. Pl. t. 41 (1836), type loc. "Monterey," *Douglas;* Jepson, Fl. W. Mid. Cal. 227 (1901), ed. 2, 193 (1911), Man. 440, fig. 428 (1925).

16. **L. dictyotum** Gray. Alkali Pepper-grass. Stems few to many or numerous from the base, decumbent, or at length ascending, 1 to 7 inches long; blades of leaves pinnate with ligulate rachis and few remote linear segments, or quite entire; herbage hirsutulose; raceme rather dense with closely ascending flattened pedicels; petals little exceeding the sepals or wanting; pods 1½ to 2 lines long, elliptic, finely reticulated, pubescent or glabrous, the wings or teeth at the summit shortly ovatish or semi-ovatish, tending to be obtuse at tip, the sinus narrow, linear.

Alkaline soils, 200 to 2000 feet: Livermore and San Joaquin valleys to coastal Southern California. Nevada to Oregon, Washington and Idaho. Mar.-Apr.

Locs.—Byron Sprs., *Davy;* Livermore, *Greene;* Four-mile Slough, Whites Bridge road, *Jepson* 11,577; San Carlos Creek, San Carlos Range, *Jepson* 2740; Cholame Valley, se. Monterey Co., *Jepson* 16,174; Smith Mt. near Dinuba, *H. P. Kelley;* Tulare, *Davy* 3050, 3068; Famoso, Kern Co., *Jepson* 11,598, 11,599; Bakersfield, *Heller* 7594; Lancaster, *Davidson;* San Bernardino, *Parish* 794; Temecula plain, *Cleveland.* Warner Valley, Lake Co., Ore., *Manning.* A marked form in low wet places on the west side of the lower San Joaquin Valley has few short (1 to 2 inches long) stems which are contorted- or recurved-decumbent: Byron Sprs., *Davy;* Los Banos, *Jepson* 11,570a. This form in habit is reminiscent of L. latipes.

Refs.—Lepidium dictyotum Gray, Proc. Am. Acad. 7:329 (1868), based on Nevada specimens, *Horace Mann* (Steamboat Sprs.), *Anderson* (sagebrush lands); Jepson, Fl. W. Mid. Cal. 228 (1901), ed. 2, 193 (1911), Man. 440, fig. 429 (1925). Var. *macrocarpum* Thell. Mitteil. Bot. Mus. Zürich 28:271 (1906), type loc. Livermore, *Greene.*

17. **L. acutidens** Howell. Mule's-ear Pepper-grass. Stem branching at or above the base, the branches comparatively simple, erect, suberect or diffuse, 4 to 12 inches high; cauline leaf-blades linear-subulate, mostly entire, the basal leaves 1 to 3¾ inches long, their blades pinnatifid with few remote linear segments; racemes elongated, usually rather dense, the pedicels erect or spreading; petals none or minute; pods glabrous or slightly pubescent, lightly reticulated, 2 to 2½ lines long, the teeth at apex widely divergent, lanceolate and wing-like, half to as long as the elliptic body; sinus triangular; pedicels flattened, somewhat curved in fruit and rather shorter than the pod.

Alkaline soil: San Diego Co.; inner South Coast Range valleys; west side San Joaquin Valley; Sacramento Valley; Lassen and Siskiyou Cos. North to Oregon. Feb.-Mar., fr. Apr.-May.

Locs.—San Diego, *K. Brandegee;* Cholame, *Jepson* 12,030; Dos Palos, *Jepson* 11,573; Los Banos, *Jepson* 11,576; Livermore Valley, *Davy;* Danville, Contra Costa Co., *Davy;* Montezuma Hills, *Jepson* 13,371; Vacaville, *Jepson* 537, 13,364; Colusa jct., *K. Brandegee;* Dixey Valley, Lassen Co., *Baker & Nutting.*

Var. **cornigerum** Jepson var. n. Plant diffuse; wings at summit of pod slender, horn-like, curved outward.—(Plantae diffusae; ad apicem siliquae alae graciles, corniculatae, extrorsae.)—Willows, *Jepson* 13,363 (type).

Refs.—Lepidium acutidens Howell, Fl. Nw. Am. 64 (1897). *L. dictyotum* var. *acutidens* Gray Proc. Am. Acad. 12:54 (1876), type loc. Yreka, *Greene. L. oxycarpum* var. *acutidens* Jepson, Man. 441, fig. 431 (1925). *L. oreganum* Greene, Fl. Fr. 274 (1871). *L. acutidens* var. *microcarpum* Thell. Mitt. Bot. Mus. Univ. Zürich 28:271 (1906), type loc. San Diego, *Jones* 3061; pods 1½ lines long. Var. cornigerum Jepson.

18. **L. oxycarpum** T. & G. Salt Pepper-grass. Stem very slender, branched from the base, the branches elongated, erect or ascending, 4 to 6 inches long, bearing flowers more than half their length; leaf-blades narrow, linear and subentire, or pinnate with a few acute linear segments; sepals very unequal, caducous, ½ line long; petals none; stamens 2; pods roundish, glabrate, finely reticulated, 1¼ lines long, tipped with 2 very short and acute widely divergent teeth; sinus usually rounded but often triangular; pedicels widely spreading or retrocurved, very slender, flattened, 1 to 1½ lines long, often longer than the pod.

Borders of salt marshes or in alkaline soils, 10 to 1400 feet: lower Sacramento Valley; South Coast Ranges from Alameda Co. to southeastern Monterey Co. Mar.

Tax. note.—Lauramay Tinsley, a student in our laboratory, finds the sepals united at base. If this be a constant character it will assist in distinguishing the closely allied L. acutidens.

Locs.—Elk Grove, Sacramento Co., *Drew;* Vacaville, *Jepson* 537a; Vallejo (Bot. Cal. 1:46); Oakland, *Michener & Bioletti;* Alviso, *Bioletti;* Livermore, *Greene;* Bolsa, near Hollister, *Jepson* 16,113; Cholame Valley, se. Monterey Co., *Jepson* 16,182.

Refs.—LEPIDIUM OXYCARPUM T. & G. Fl. 1:116 (1838), type from California, *Douglas;* Jepson, Fl. W. Mid. Cal. 228 (1901), ed. 2, 193 (1911), Man. 440, fig. 430 (1925).

Hymenophysa C. A. Mey. Perennial herbs with undivided leaves. Flowers white. Pods subglobose, bladdery-inflated, tardily or scarcely dehiscent; partitions thin or interrupted; seeds 1 to 4 in each cell. H. PUBESCENS C. A. Mey.; Ledeb. Fl. Alt. 3:181 (1831). Stems erect or ascending, ¾ to 2 feet high simple below, branching above and forming a corymbose panicle of dense racemes; herbage puberulent; leaves oblong, subentire or denticulate, sessile, all except the lowest auriculate, ¾ to 3 inches long; pedicels mostly ascending; flowers 1 line long; pods somewhat globose-inflated, elliptic in outline, pubescent, 2 to 2¼ lines long.—Native of Asia, sparingly naturalized: Tiger Inn, e. Yolo Co., *H. P. Bellue* in 1932; Los Angeles, *T. W. Minthorn* 5 in 1910. May-June. The plant has the general aspect of Lepidium draba, especially in habit and inflorescence.

27. SUBULARIA L. Awlwort

Small aquatic perennials. Stem simple, scape-like, with a cluster of linear-subulate leaves at base. Flowers minute, white, loosely racemose. Stamens 6, scarcely unequal; anthers oval. Stigma sessile, slightly 2-lobed. Pod elliptic or obovate, scarcely flattened, the valves convex, 1-ribbed on the back. Seeds few, in 2 rows in each cell.—Species 2, the following and a second in east Africa. (Latin subula, an awl, in reference to the leaves).

1. **S. aquatica** L. Stems 1 to 4 inches high, arising from a dense cluster of bright white root-fibres; leaves unequal, erect or slightly spreading, thickish at the base, ½ to 1½ inches long; scape flowering from below the middle, the submersed flowers minute, cleistogamous; pods 1 to 1½ lines long, upon short spreading pedicels.

Submersed or growing on muddy banks of ponds, lakes or in running water: coastal San Diego Co.; Sierra Nevada from Mono Co. to Sierra Co., 7000 to 10,000 feet. North to British America; Europe, Asia.

Locs.—San Diego (Davidson & Moxley, Fl. S. Cal. 153); Mono Pass (Bot. Cal. 1:43); Donner Lake, *Sonne;* Webber Lake (Gray, Syn. Fl. 1^1:130).

Refs.—SUBULARIA AQUATICA L. Sp. Pl. 642 (1753), type European; Jepson, Man. 441 (1925).

28. PLATYSPERMUM Hook.

Low glabrous annual with the leaves in a basal rosette. Flowers minute, solitary on naked scapes. Sepals equaling the white petals. Pod suborbicular, flattened parallel to the broad partition. Seeds reticulated, broadly winged, in 2 rows.—Species 1. (Greek platus, broad, and sperma, seed.)

1. **P. scapigerum** Hook. Scapes 1 to 4½ inches high; leaves lyrately pinnatifid with few lobes or reduced to a single ovate or rhombic lobe; pods 3 to 6 lines long, 8 to 12-seeded.

Moist gravelly places in montane valleys, 2500 to 5500 feet: Mt. Hamilton Range; Sierra Co. to Siskiyou Co. Nevada northerly to Idaho. Feb.-Mar., fr. Mar.-Apr.

Locs.—Packard Ridge, Mt. Hamilton Range, *Mason* 7209; Sierra Co., *Lemmon* (Bot. Cal. 1:27); Susanville; Big Valley, Modoc Co., *M. S. Baker* 76; Goose Lake Valley, *R. M. Austin* 8; Edgewood, Siskiyou Co., *J. W. Kisling;* Little Shasta, *F. W. Hooper;* Yreka, *Butler* 1136. Nev.: Steamboat Sprs., *Sonne* 1340.

Refs.—PLATYSPERMUM SCAPIGERUM Hook. Fl. Bor. Am. 1:68, t. 18B (1830), type loc. Great Falls, Columbia River, *Douglas;* Jepson, Man. 441, fig. 432 (1925). *Idahoa scapigera* Nels. & Mcbr. Bot. Gaz. 56:474 (1913).

29. ALYSSUM L.

Low branching herbs with small white or yellowish flowers. Pod in ours orbicular, flattened; cells 1 or 2-seeded. Cotyledons accumbent.—Species about 100, Europe, Asia, north Africa. (Greek, a, without, lussa, madness, in ancient times a supposed antidote for hydrophobia.)

Pubescence of simple appressed hairs; pods marginless, pointed..............................1. *A. maritimum.*
Pubescence stellate; pods narrowly margined, slightly emarginate above..............2. *A. alyssoides.*

1. **A. maritimum** Lam. SWEET ALYSSUM. Perennial; leaf-blades narrowly lanceolate or linear; petals white, 2 lines long, twice as long as the deciduous sepals; filaments not toothed; pod 2-seeded.

Garden plant from Europe, occurring as an escape: coastal region. May-Sept.

Locs.—San Diego, *W. S. Wright* 115; Del Mar, San Diego Co., *Jepson* 1619; Catalina Isl. (Erythea 7:142); Santa Cruz, *Berg;* East Oakland, *H. A. Walker* 688; San Francisco, *Jepson* 10,239.

Refs.—ALYSSUM MARITIMUM Lam. Encyl. 1:98 (1783); Jepson, Fl. W. Mid. Cal. 226 (1901), ed. 2, 193 (1911), Man. 442 (1925). *Clypeola maritima* L. Sp. Pl. 652 (1753), type south European. *Koniga maritima* R. Br.; Britt. & Br. Ill. Fl. 2:153, fig. 1788 (1897). *Lobularia maritima* Desv. Jour. Bot. 3:162 (1814).

2. **A. alyssoides** L. SMALL ALYSSUM. Annual; leaves narrowly oblanceolate; petals yellowish white, 1½ lines long, scarcely exceeding the sepals; sepals persistent about the base of the fruit; filaments of the shorter stamens toothed at base; pod 4-seeded.

Garden plant from Europe. Naturalized in Siskiyou Co. and at one time adventive in the San Francisco Bay region.

Locs.—Yreka, *Butler* 1341; Cottonwood Creek, Siskiyou Co., *Butler* 722; Sisson, *Heller* 8054.

Refs.—ALYSSUM ALYSSOIDES L. Syst. ed. 10, 1130 (1759); Britt. & Br. Ill. Fl. 2:153, fig. 1787 (1897); Jepson, Fl. W. Mid. Cal. 226 (1901), ed. 2, 191 (1911), Man. 442 (1925). *Clypeola alyssoides* L. Sp. Pl. 652 (1753), type European. *A. calycinum* L. Sp. Pl. ed. 2, 908 (1763).

30. CAPSELLA Medic.

Slender annuals with pinnatifid leaves and small white flowers. Petals small, little exceeding the sepals. Pod obcordate or elliptical, strongly or scarcely at all flattened, several-seeded; valves carinate. Seeds not winged; cotyledons incumbent.—Species 4, northern hemisphere. (Latin capsella, a little box.)

Pod obcordate, or cuneate-triangular in outline with retuse apex, strongly flattened........................ 1. *C. bursa-pastoris.*
Pod elliptic-oblong, scarcely flattened, entire at the apex...2. *C. procumbens.*

1. **C. bursa-pastoris** Moench. SHEPHERD'S PURSE. Stems erect, simple or branching, 3 to 18 inches high, sparsely hispid; basal leaves in a spreading rosette; lower leaves petioled, their blades pinnatifid, rarely entire, the terminal lobe largest; blades of upper leaves merely dentate, sessile-auriculate; petals ¾ to 1½ lines long; pedicels elongating in fruit, 4 lines long; pods obcordate, 2½ to 3 lines broad, many-seeded, strongly flattened.

Common in pastures, orchards and by waysides, 10 to 6000 feet, naturalized from Europe: throughout cismontane California. Feb.-Apr.

Note on variation.—Capsella bursa-pastoris is variable in foliage and shape of pod. To what degree is partly evident from the studies of E. Almquist (Acta Hort. Berg. 4^6:1–91,—1907; 7:41–95 figs. 1–16,—1923) who, on the basis of cultures which he believed constant, described 200 species chiefly with reference to the structure of the pod.

Locs.—Sierra Nevada: Shepherd Cove, near Kaweah, *W. Fry* 410; Pine Ridge, Fresno Co.; Hodgdon Ranch, Tuolumne Co., *Jepson* 10,542; Yosemite, *Bioletti;* Jackson, *Hansen;* Donner

Lake, *Heller* 6871; Modoc Co., *M. S. Baker;* Little Shasta, *F. W. Hooper.* Coast Ranges: Eureka, *Tracy* 3186; Ukiah, *Purdy;* Little Oak, Solano Co., *Jepson* 13,392; Berkeley, *Davy;* Corral Hollow, *Jepson* 9579; Mission Soledad, *Jepson* 8430; San Luis Obispo, *Palmer* 27. S. Cal.: Saugus, *Davy;* Los Angeles; Santa Ana, *Alice King;* Escondido, *C. V. Meyer.*

Refs.—CAPSELLA BURSA-PASTORIS Moench, Medic. Pfl. Satt. 1:85 (1792); Jepson, Fl. W. Mid. Cal. 223 (1901), ed. 2, 189 (1911), Man. 442 (1925). *Thlaspi bursa-pastoris* L. Sp. Pl. 2:647 (1753), type European. *Bursa bursa-pastoris* Britt. Mem. Torr. Club 5:172 (1894).

2. **C. procumbens** Fries. NANNIE'S PURSE. (Fig. 143.) Stems several from the base, erect or ascending, 3 to 6 inches high; leaves with oblanceolate or spatulate blades, or the lower or all with more or less pinnatifid blades; flowers minute, ½ line long or less; sepals ovate-elliptic, thin-margined, about equaled by the petals; pods elliptic-oblong, entire at the apex, 1 to 1½ lines long; pedicels filiform, in fruit 2 to 4 lines long and divaricately spreading.

Alkaline soil, 5 to 4500 feet: Southern California and north to Alameda, Tulare, and Inyo Cos. Far north to British Columbia. Europe, Asia. Feb.-Mar.

Locs.—San Felipe, e. San Diego Co., *T. Brandegee;* Grapevine Cañon, e. San Diego Co., *T. Brandegee;* San Bernardino Valley, *Parish;* Antelope Valley, *Davidson;* Santa Rosa Isl., *T. Brandegee;* Santa Cruz Isl., *T. Brandegee;* Oxnard, *Davy;* Pacific Grove, *Heller* 6700; Alameda, *Greene;* Byron, Contra Costa Co., *Bioletti;* Tulare Lake, *T. Brandegee;* Del Sur, Kern Co., *Davidson;* Mohave, *Davidson;* Little Lake, Inyo Co. Warner Valley, Lake Co., s. Ore., *Manning.*

Refs.—CAPSELLA PROCUMBENS Fries, Novit. Fl. Suec. Mant. 1:14 (1832); Jepson, Fl. W. Mid. Cal. 224 (1901), ed. 2, 190 (1911); Man. 442 (1925). *Lepidium procumbens* L. Sp. Pl. 643 (1753), type loc. "Monspelii". *C. elliptica* C. A. Meyer; Ledeb. Fl. Alt. 3:199 (1831); Gray, Syn. Fl. 1^1:131 (1895). *Hutchinsia procumbens* Desv. Jour. Bot. 3:168 (1814); Britt. & Br. Ill. Fl. ed. 2, 2:158, fig. 2023 (1913).

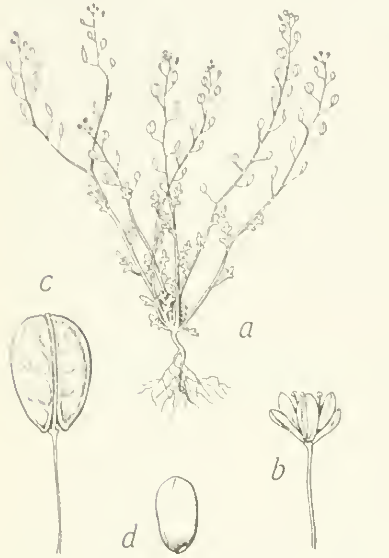

Fig. 143. CAPSELLA PROCUMBENS Fries. *a*, habit, × ½; *b*, fl., × 5; *c*, pod, × 5; *d*, seed, × 10.

31. CAMELINA Crantz

Erect annual with sagittate-clasping leaves. Flowers small, light yellow in a loose raceme. Pod obovate or pear-shaped, beaked with the persistent style; valves convex with flattened edges forming a narrow margin; seeds several in each cell; cotyledons incumbent.—Species 5, Europe and Asia. (Greek camai, dwarf, and linon, flax.)

1. **C. sativa** Crantz. FALSE FLAX. Stem simple or branching above, 1 to 3 feet high, leafy, nearly glabrous; leaf-blades oblong to lanceolate, entire or dentate; pods 3¼ to 4 lines long, 2 to 2½ lines broad.

Old World weed of grain fields, occasional in California.

Locs.—Yreka, *Butler* 622, 1054; Sisson, *Blasdale;* Truckee, *Helen Geis* 34; Glendale, *Ethel M. Rockwell;* Swartout Valley, San Gabriel Mts., *Peirson* 3181.

Refs.—CAMELINA SATIVA Crantz, Stirp. Austr. ed. 1, 1:14 (1762), type loc. Austria; Jepson, Fl. W. Mid. Cal. 224 (1901), ed. 2, 190 (1911), Man. 442 (1925).

32. DRABA L.

Low annual or perennial herbs with a pubescence of simple, forked or stellate hairs. Flowers white or yellow, in racemes. Petals entire, notched or bifid. Style short or slender; stigma simple or very slightly lobed. Pod oval to oblong or linear-oblong, flat; partition thin-membranous. Seeds in 2 rows, neither margined nor winged. Cotyledons accumbent or rarely incumbent.—Species 150, all continents except Australia, but mostly arctic or alpine, the plant body, therefore, reduced and often very variable. (Greek drabe, a name of Dioscorides for some cress.)

A. Annuals; low altitudes (except no. 5).

Flowers secund, on reflexed pedicels; pods short, twisted........1. *D. unilateralis.*
Flowers not secund.
  Petals not entire; pods straight or nearly so.
    Petals deeply 2-cleft; corolla white; pods glabrous........2. *D. verna.*
    Petals retuse,
      Little exceeding the sepals; corolla yellowish, becoming white; pods puberulent........3. *D. nemorosa.*
      Nearly twice as long as the sepals; corolla white; pods pubescent or glabrous........4. *D. cuneifolia.*
  Petals entire, obtuse or truncate; corolla yellow; pods glabrous, usually a little curved........5. *D. stenoloba.*

B. Perennials; alpine or subalpine plants with branched densely leafy root-crown.

Leaves not carinate, soft.
  Style ¼ to ¾ line long.
    Flowers yellow; leaves loosely or thinly pubescent or ciliate.
      Flowering stems conspicuously leafy; leaf-blades oblong-linear; pods pubescent, not twisted........6. *D. aureola.*
      Flowering stems naked or few-leaved, arising from a densely leafy cushion; leaf-blades broadly spatulate or oblanceolate.
        Leaves ciliate, surface hairs simple or forked; branches of root-crown densely leafy; pod pubescent or glabrous, undulate or twisted..7. *D. lemmonii.*
        Leaves stellate-pubescent, not ciliate; branches of root-crown leafy only at tip; pods glabrous, not twisted........8. *D. nivalis.*
    Flowers white; leaf-blades oblong, canescent; pods pubescent; stigma subsessile........9. *D. breweri.*
  Style 1 to 2 lines long.
    Flowering stems mostly with reduced leaves, commonly much branched; corolla pale yellow, about 1 line long........10. *D. corrugata.*
    Flowering stems naked, simple; corolla deep yellow, 2 to 4 lines long........11. *D. howellii.*
Leaves carinate by the prominent midnerve, becoming rigid, with reflexed margin; alpine or subalpine cushion plants.
  Racemes produced beyond the leaves; corolla yellowish, fading white; pods mostly flattened; var. of........12. *D. oligosperma.*
  Racemes mostly hidden by the leaves; corolla white; pods about as thick as broad........13. *D. douglasii.*

1. **D. unilateralis** Jones. Stem short, parting into 2 or 3 racemes; racemes lax, diffuse, or horizontal and trailing, in age rigid and wiry, 6 to 18 inches long; leaf-blades cuneate-obovate to oblanceolate, 4 to 12 lines long, few-toothed or entire, sessile; flowers 1 line long, on pedicels ½ as long; pods round-oval, 1 to 2½ lines long, hispidulous, twisted when mature, tardily dehiscent, the pedicels thick, recurved, ½ to 1 line long.

Hillsides and valleys, 100 to 800 feet: inner Coast Range from Fresno Co. to Colusa Co.; Tehachapi Mts. South to Lower California, north to Oregon. Apr.

Tax. note.—This is a peculiar species whose phylogeny is not as yet well understood. It is the monotype of Greene's proposed genus Heterodraba. The pods are often distant 1 inch or more. The seeds are mostly 8 to 11.

Locs.—Tehachapi Mts. (n. slope), acc. *Peirson.* Coast Ranges: Zapato Chino, sw. Fresno Co., *T. Brandegee;* upper San Benito River, near James Creek, *E. Crum* 995; Livermore, *Bioletti;* Byron, Contra Costa Co., *Bioletti;* Lake Co., *K. Brandegee;* Sites, Colusa Co., *T. Brandegee.* Ashland, Ore., *Howell.*

Refs.—DRABA UNILATERALIS Jones, Bull. Torr. Club 9:124 (1882), type loc. All Saints Bay, L. Cal., *Jones.* *Heterodraba unilateralis* Greene, Bull. Cal. Acad. 1:72 (1885). *Athysanus unilateralis* Jepson, Fl. W. Mid. Cal. 224 (1901), ed. 2, 190 (1911), Man. 446 (1925).

2. **D. verna** L. Shad-flower. Stems erect or ascending, 2 to 4 (or 6) inches high, naked, several from a rosulate cluster of leaves; leaf-blades ovate to lanceolate, toothed near the apex, sessile or shortly petioled, 2 to 6 lines long; petals cleft nearly or quite to the middle, 1 line long, nearly twice as long as the acutish sepals; pods oval, 2 to 3 lines long.

Sterile or gravelly soil: Lake Co. to Siskiyou Co. Introduced from Europe. Apr. It is sometimes biennial.

Locs.—Kelseyville, *Blankinship;* Potter Valley, *R. M. Holman;* Mendocino Co., comm. *Gertrude Anthony;* Carlotta, Van Duzen River, *Tracy* 5986; Shasta River hills, Siskiyou Co., *Butler* 1143; Yreka, *Butler* 549, 575.

Refs.—Draba verna L. Sp. Pl. 642 (1753), type European; Jepson, Man. 443 (1925).

3. **D. nemorosa** L. Wood Whitlow. Stems slender, several from the base, 1¾ to 4 (or 12) inches high in ours, pubescent below; leaves basal and sub-basal but rarely rosulate, the blades ovate to oblong-lanceolate, slightly dentate, 2 to 9 lines long, sessile or the lowest petiolate; stems usually flowering from near the base; calyx somewhat villous; petals yellow, becoming whitish, slightly retuse; pods elliptic- to narrow-oblong, minutely pubescent, 2½ to 6 lines long, much shorter than the divaricate pedicels (6 to 9 lines long).

Thickets and woods, 2500 to 3000 feet: Siskiyou Co. North to British Columbia and east to the Rocky Mts. and Ontario. Europe, Asia. Mar.

Loc.—Yreka, *Butler* 1162.

Refs.—Draba nemorosa L. Sp. Pl. 643 (1753), type loc. Sweden; Jepson, Man. 443 (1925).

4. **D. cuneifolia** Nutt. Desert Whitlow. Stems several to many from the base, ascending or diffuse, 2 to 10 inches high; leaves basal or mostly basal, the blades oblanceolate to obovate, entire or serrately few-toothed, stellate-pubescent, sessile or the lowest sometimes petiolate, ¼ to 1¼ inches long; racemes rather dense, or somewhat lax in age, borne on mostly naked stems commonly as long or longer; petals white, notched at apex, the claw very long; pods linear-oblong to narrow-elliptic, pubescent (the hairs forked or occasionally some hairs simple) or glabrous, 3 to 6 lines long, exceeding the pedicels.

Dry sandy soil, 1000 to 2500 feet: Colorado and Mohave deserts; Death Valley region. East to Texas and Illinois. Mar.

Locs.—Vallecito, Colorado Desert, *Jepson* 8576; Grapevine Spr., e. San Diego Co., *T. Brandegee;* Goffs, Mohave Desert, *Newlon* 537; Bradbury Well, Black Mts., Death Valley, *J. T. Howell* 3635.

Note on variation.—Segregation of individuals on the basis of stellate or simple hairs is not natural. No individuals have only stellate hairs. Individuals with glabrous pods and individuals with pubescent pods, otherwise identical, occur in a collection from Grapevine Spr., *T. Brandegee.* The styles in specimens with glabrous pods vary in prominence, just as do the styles in specimens with pubescent pods. The glabrous-podded plants have lax racemes, but so have most of the pubescent-podded cismontane plants (var. integrifolia). The glabrous-podded plants vary in size of pod and length and pubescence of pedicel.

Var. **integrifolia** Wats. Stems 1 to several from the base; flowering from near the base, usually with a few leaves below as well as basal; racemes loose, commonly longer than in the species; pods oblong.—Dry sandy soil of the foothills and valleys of cismontane Southern California. East to Arizona, south to northern Mexico.

Locs.—Pods pubescent: Slover Mt., San Bernardino, *Parish* (in part); Riverside; Fall Brook, San Diego Co., *Jones* 3105 (in part). Pods glabrous: Santa Maria (Syn. Fl. 1^1:107); San Bernardino Valley, *Parish* 5980; Slover Mt., *Parish* (in part); Fall Brook, San Diego Co., *Jones* 3105 (in part); San Diego.

Var. **californica** Jepson. Stems strictly erect, 3 to 5½ inches high; leaves in a dense basal tuft, the stems nearly naked, flowering from about the middle or a little below; herbage and pods puberulent; petals obtuse or obscurely notched; pods oblong-lanceolate, 3 to 3½ lines long, ascending.—White Mts., Inyo Co.

Refs.—Draba cuneifolia Nutt.; T. & G. Fl. 1:108 (1838), type loc. St. Louis, Mo., *Nuttall;* Jepson, Man. 443 (1925). Var. integrifolia Wats. Proc. Am. Acad. 23:256 (1888), type loc.

Coast Ranges of S. Cal.; Jepson l.c. *D. integrifolia* Greene, Pitt. 4:201 (1900). *D. sonorae* Greene, Bull. Cal. Acad. 2:59 (1886), type loc. nw. Sonora, *Pringle*. *D. cuneifolia* var. *sonorae* Parish, Bull. S. Cal. Acad. 2:82 (1903). Var. CALIFORNICA Jepson, Man. 443 (1925), type loc. North Fork Crooked Creek, White Mts., *Jepson* 7261.

5. **D. stenoloba** Ledeb. ALEUT DRABA. Stems several from a basal leaf-tuft, erect or lax, slender, 5 to 13 inches high, ¾ to 3 (or 5) inches high in alpine dwarfs; herbage more or less villous; leaves mostly in a subrosulate basal tuft, ½ to ¾ (or 1½) inches long (or only 2 to 3 lines long in the alpine dwarfs), the blades oblong-ovate or oblanceolate, thin, narrowed to a broad petiole, the one or two cauline ones sessile, ovate to oblong-oblanceolate; sepals glabrous or sparingly pilose; petals yellow, rarely purplish, becoming white in age, entire, obtuse or truncate; fruiting raceme very open; pods linear, usually a little curved, acute, glabrous, 4 to 7 lines long, equal to or shorter than the spreading or divaricate pedicels.

Subalpine wet meadows, 7000 to 12,000 feet: Sierra Nevada from Tulare Co. to Modoc Co.; White Mts. East to the Rocky Mts., north to Alaska. June-July.

Locs.—Sierra Nevada: Freeman Creek, Tulare Co., *Jepson* 4886; Mt. Silliman, *Jepson* 746; Huntington Lake, Fresno Co., *Jepson* 12,972; Cloud's Rest, *Chesnut & Drew;* Yosemite Park, *Jepson* 4510 (Benson Lake), 4553 (Mary Lake), 4423 (Lake Merced), 3307a (Mt. Dana); Tallac, *J. T. Howell* 1408; Webber Lake, *Sonne;* Lake City Cañon, Modoc Co., *C. C. Bruce* 2248. White Mts.: Campito Mdw., *Jepson* 7333.

Refs.—DRABA STENOLOBA Ledeb. Fl. Ross. 1:154 (1841), type loc. Aleutian Isls.; Jepson, Man. 444, fig. 433 (1925). *D. nitida* Greene, Pl. Bak. 3^1:7 (1901), type loc. Marshall Pass, Col., *C. F. Baker* 492; O. E. Schulz in Engler's Pflzr. 4^{105}:319 (1927). *D. nitida* var. *praelonga* Schulz, l.c.; stems 1 foot high; pedicels ½ to 1 inch long.—Soda Sprs., Nevada Co., and north to Washington and Canada acc. Schulz.

6. **D. aureola** Wats. VULCAN DRABA. Stems simple, 2 to 4 inches high, crowded with leaves at base, arising from a simple or branched root-crown; herbage rather densely stellate-pubescent throughout; blades of the basal leaves oblanceolate, obtuse, entire, 6 to 8 lines long, blades of the cauline oblong, shorter, broadened at base, almost auriculate; raceme densely crowded in flower and fruit; calyx glabrous; petals yellow; pods broadly oblong, obtuse, pubescent, not twisted, 4 to 5 lines long, on spreading pedicels 2 to 3 lines long; style short (half line long), stout.

Known only from four volcanic peaks (7000 to 11,000 feet): Lassen Peak, California; Diamond Peak, Oregon; Three Sisters, Oregon; Mt. Rainier, Washington. May-June.

Refs.—DRABA AUREOLA Wats. Bot. Cal. 2:430 (1880), type loc. Lassen Peak, *Lemmon, R. M. Austin;* Jepson, Man. 444, fig. 434 (1925); O. E. Schulz in Engler, Pflzr. 4^{105}:195 (1927). *D. aurea* Wats. l.c. 1:28 (1876), not Vahl.

7. **D. lemmonii** Wats. GRANITE DRABA. Stems naked, 1 to 3¼ inches high, pilose with spreading hairs or glabrous, rising from a compact leafy cushion of the much branched root-crown; leaf-blades thick, spatulate to oblong-obovate, mostly very obtuse, conspicuously ciliate, and the surface glabrous or sparingly hirsutulose with simple or forked hairs, 2 to 5 lines long; racemes short; petals yellow, 2 lines long; sepals somewhat villous or subglabrous; pods oval or ovate to broadly lanceolate, more or less undulate or twisted, pubescent or glabrous, 2½ to 4 lines long, on slender spreading pedicels 1 to 2 or 4 lines long.

Alpine peaks, rooting in the clefts of rocks, 9000 to 13,000 feet: Sierra Nevada from Alpine Co. to Tulare Co. Western Nevada and eastern Oregon. July-Aug.

Locs.—Ebbets Pass, *Brewer;* Tower Peak, Yosemite Park, *Jepson* 4552; Mt. Dana, *Jepson* 3292; Mt. Lyell, *Jepson* 3337a; Koip Peak, *Kennedy;* Silver Pass, Fresno Co., *A. L. Grant* 1542; Kaiser Peak, *A. L. Grant* 1437; Evolution Basin, *E. V. Ferguson* 480; Alta Mdws., Kaweah River Basin, *Hopping* 514, 517; Mt. Brewer, *Brewer* 2811; Mt. Whitney, *Burton & Ryerson* 41, *Purpus* 1621, 2004; Columbine Lake, Sawtooth Range, Tulare Co., *Jepson* 4998; Mt. Guyot, *Mary Haskell*.

Refs.—Draba lemmonii Wats. Bot. Cal. 2:430 (1880), type loc. summit of Mt. Lyell, 13,000 ft., *Lemmon;* Jepson, Man. 444 (1925). *D. cyclomorpha* Payson, Am. Jour. Bot. 4:263 (1917), type loc. Mt. Brewer, *Brewer* 2811. *D. lemmonii* var. *cyclomorpha* O. E. Schulz; Engler, Pflzr. 4^{105}:94 (1927). *D. longisquamosa* O. E. Schulz, l.c., based on *Purpus* 5118, doubtless from the southern Sierra Nevada. *D. cruciata* Payson, Am. Jour. Bot. 4:265 (1917), type loc. Mineral King, Tulare Co., *Hall & Babcock* 5361.

8. **D. nivalis** Lilj. var. **californica** Jepson. California Draba. Root-crown rather loosely branched, its branches of the season producing a rosette of leaves at apex and the next season slender naked flowering stems 3 to 4 inches high; leaf-blades oblanceolate, acutish, obscurely repand, usually with a pair of short teeth toward the apex, slightly thickened, thinly stellate-pubescent, not ciliate, 3 to 4 lines long; sepals ½ line long, glabrous, thin-margined, yellow; petals bright yellow, 2½ lines long; stamens less than ½ the length of the petals; pods linear-lanceolate, acuminate, generally slightly oblique, 4½ lines long, glabrous; style slender, ¼ to ½ line long.

Alpine slopes, 9000 feet: Sierra Nevada in Tulare Co.; rare.

Loc.—Mineral King, *T. Brandegee* (in 1892).

Refs.—Draba nivalis Lilj. Vet. Akad. Handl. 1793:208 (1793). Var. californica Jepson, Man. 444 (1925), type loc. Mineral King, *T. Brandegee.*

9. **D. breweri** Wats. Cushion Draba. Alpine dwarf, the stems 1 to 4 inches high, arising from a densely leafy cushion; herbage hoary with a stellate pubescence; blades of basal leaves oblong, obtuse, entire or rarely sparingly toothed, 2 to 4 lines long, sessile or narrowed to a broad petiole, 2 to 4 lines long; cauline leaves few, oblong-ovate; sepals oblong; petals white, 1 to 1½ lines long; pods linear-oblong, obtusish, often twisted, pubescent, 2 to 3 lines long, on short ascending pedicels; stigma sessile or nearly so.

Alpine rocky slopes and summits, 10,000 to 13,500 feet: Sierra Nevada from Siskiyou Co. to Tulare Co.; White Mts. June-July.

Locs.—Mt. Shasta (N. Am. Fauna, 16:147); Lassen Peak, *R. M. Austin;* Mt. Dana, *Jepson* 3316; Mt. Warren, *Congdon;* Harrison Pass, Tulare Co., *Jepson* 5040; Mt. Whitney, *Jepson* 1065; White Mts., Mono Co., *Shockley* 439, *Jepson* 7322.

Var. **sublaxa** Jepson. Stems 4 to 7 inches high; pubescence thinner; lower leaves less crowded, the blades oblanceolate, toothed or entire, thinner, 6 to 9 lines long; pods oblong-lanceolate to lanceolate, acute or acuminate, 3 to 4 lines long.—Saddle between Mt. Dana and Mt. Gibbs.

Refs.—Draba breweri Wats. Proc. Am. Acad. 23:260 (1888), based on spms. from Mt. Dana, *Brewer,* and White Mts., Mono Co., *Shockley;* Jepson, Man. 444 (1925). Var. sublaxa Jepson, l.c., type loc. saddle between Mt. Dana and Mt. Gibbs, *Chesnut & Drew.*

10. **D. corrugata** Wats. Penance Draba. Stems several from a simple or somewhat branched root-crown, 2 to 9 inches high; herbage loosely pubescent with branching hairs; leaves in a dense basal tuft, few or much reduced on the flowering stems, ¼ to 1 (or 2) inches long, the blades oblong-oblanceolate to narrow-obovate, obtusish, entire, usually narrowed at base to a broad petiole; sepals pubescent; petals pale yellow, narrowly linear-cuneate, 1¼ lines long, notched at apex; pods lanceolate to broadly oblong, acute or obtuse, pubescent, much corrugated and twisted, 2 to 5 lines long, on pedicels 1 to 5 lines long; style 1 line long.

Alpine at 9500 to 11,500 feet, but descending to forest areas at 8000 feet: San Gabriel, San Bernardino and San Jacinto mountains. June.

Ecol. note.—The size of plants and leafiness of the flowering stems vary greatly with situation. Plants of the mountain summits (the form called *Draba saxosa* Dav.) have scapose flowering stems, are generally reduced in size and resemble D. lemmonii in foliage but may be distinguished by their more slender exserted styles and exserted stamens.

Locs.—Ontario Ridge, *Peirson* 57; Mt. San Bernardino, *J. Grinnell* 45; Mt. San Gorgonio, *W. G. Wright;* South Fork Santa Ana Cañon, *Hall* 7509 (in fir forests, plants 9 to 10 inches high); Mt. San Jacinto, *F. M. Reed* 2517; El Toro, Santa Rosa Mts., *Munz* 5870.

Refs.—DRABA CORRUGATA Wats. Bot. Cal. 2:430 (1880), type loc. Mt. San Gorgonio (Grayback), *Lemmon;* Jepson, Man. 445, fig. 435 (1925). *D. vestita* Dav., Bull. S. Cal. Acad. 15:17, pl. (1916), type loc. Mt. San Antonio, *Fred Burlew. D. saxosa* Dav. l.c. 19:11 (1920), type loc. Mt. San Jacinto summit, *Davidson. D. corrugata* var. *saxosa* M. & J. Bull. Torr. Club 49:352 (1922).

11. **D. howellii** Wats. ROSETTE DRABA. Flowering stems naked, 2 to 4 inches high, arising from the densely leafy cushion of the much-branched root-crown; herbage finely soft-pubescent throughout; leaves in very dense somewhat globular rosettes, 1½ to 2 lines long, the blades broadly spatulate or oblong, mostly very obtuse, sessile or narrowed to a broad petiole; flowers large (3 to 4 lines long), in loose racemes; petals deep yellow; pods oblong, often somewhat oblique or subfalcate, acute at each end, pubescent, 2 to 4 lines long, on pedicels 2½ to 4 lines long, the style slender, 1 to 1½ lines long; seeds winged, narrowly on the sides, rather broadly at apex.

Montane, crevices of rocks, about 7000 to 7500 feet: Siskiyou Mts.; Marble Mt. June.

Locs.—The original plants were obtained by Howell in the Siskiyou Mts. of California, undoubtedly on Preston Peak (cf. Schulz in Pflzr. 4^{105}:82). Seeds of the Preston Peak plant are described by Schulz as provided with a membranous appendage at apex ("apice appendicula membranacea instructa"). The Marble Mt. plants of Siskiyou Co. (*Butler* 33, 1716, *Chandler* 1654) have the seeds winged except at base, but always most broadly at apex and rather narrowly on the sides. In an occasional seed the wing on the side is extremely narrow. We are, therefore, inclined to retain the Marble Mt. plants (D. pterosperma Payson) as representing a rather natural variation under D. howellii.

Refs.—DRABA HOWELLII Wats. Proc. Am. Acad. 20:354 (1885) type loc. Siskiyou Mts., Cal., *Howell;* Jepson, Man. 445 (1925); O. E. Schulz in Engler, Pflzr. 4^{105}:81 (1927). *D. pterosperma* Payson, Am. Jour. Bot. 4:266 (1917), type loc. Marble Mt., *Butler* 1716.

D. CARNOSULA O. E. Schulz in Engler, Pflzr. 4^{105}:82 (1927), type loc. Mt. Shasta (n. side), *H. E. Brown* 463; leaves fleshy.

12. **D. oligosperma** Hook. var. **subsessilis** O. E. Schulz. MONO DRABA. Flowering stems naked, slender, ¼ to 2½ inches high, pilose or glabrate, few-flowered, arising from the dense cushion of the much-branched root-crown; leaves linear to oblong, sessile or subsessile, in dense terminal rosettes on the branches of the root-crown, 1 to 2 (or 3) lines long, mostly grayish-pubescent; sepals sparingly villous or glabrous; petals yellowish, fading white; pods ovate to ovate-oblong, acute, rounded (or sometimes acute) at base, strongly flattened or rarely a little thickened, usually finely pubescent, 1 to 3 lines long on pedicels 1 to 6 lines long; style ¼ to ½ line long; seeds 2 to 4 or 6.

Alpine summits and high ridges, in rocky places, 11,600 to 13,300 feet: Sierra Nevada from Mariposa Co. to Nevada Co.; White Mts.; Mono Co. East to the Rocky Mts., north to British America. July.

Locs.—Our high alpine plants (Nevada Co. to Mariposa Co.) with short leaves and short flowering stems are quite uniform save in pubescence of the foliage. The following variation in this feature may be noted: (a) leaves densely stellate-pubescent and ciliate, at least at base (Tinkers Knob, *Sonne,* Mt. Dana, *Brewer* 1735a, Sheep Mt., White Mts., *Jepson* 7312, White Mountain Peak, *Jepson* 7388); (b) leaves ciliate and glabrate (Mt. Warren, *Congdon,* Mt. Dana, *Jepson* 3292a, Mt. Stanford, Nevada Co., *Sonne*); (c) leaves stellate-pubescent (Mt. Dana, *Lemmon, Chesnut & Drew*). The pods are somewhat thickened in the following: White Mts., Mono Co., *Shockley* 455; Mt. Rose, Washoe Co., Nev., *Kennedy.*

Var. **saximontana** O. E. Schulz. Scapes glabrous; sepals occasionally glabrous.—White Mts., Inyo Co. North to British Columbia, east to Wyoming.

Var. **pectinata** Jepson comb. n. Taller (3 to 4½ inches high) and with greener glabrous ciliate-pectinate leaves.—Castle Peak, *Sonne;* Mt. Lola, *Lemmon;* Lake City Pass, Modoc Co., *Austin & Bruce.*

Refs.—DRABA OLIGOSPERMA Hook. Fl. Bor. Am. 1:51 (1829), type loc. Mackenzie River, lat. 68°, British America, *Richardson.* Var. SUBSESSILIS O. E. Schulz; Engler, Pflzr. 4^{105}:100 (1927). *D. subsessilis* Wats. Proc. Am. Acad. 23:255 (1888), type loc. White Mts., Mono Co., *W. H. Shockley* 455. *D. glacialis* Gray, Syn. Fl. 1^{1}:112 (1895); Jepson, Man. 445, fig. 436 (1925).

Var. SAXIMONTANA O. E. Schulz; Engler, Pflzr. 4^{105}:99 (1927). *D. saximontana* Nels. Bull. Torr. Club 27:264 (1900), type loc. Laramie plains, Wyo., *Nelson* 4323. Var. PECTINATA Jepson. *D. glacialis* var. *pectinata* Wats. Proc. Am. Acad. 23:260 (1888). *D. densifolia* Nutt.; T. & G. Fl. 1:104 (1838), type loc. n. Rocky Mts., *Nuttall.*

13. **D. douglasii** Gray. ALKALI DRABA. Flowering stems several to many, ½ to 1 inch high, arising from a branched and densely leafy root-crown; leaf-blades very narrowly oblanceolate, acute or acuminate, firm or even somewhat cartilaginous, pubescent, or glabrate except the ciliate margins, 3 to 6 lines long; petals white; pods ovate, acuminate, 1½ to 2 lines long, pubescent with simple hairs; valves becoming strongly convex; style slender, ½ to 1 line long; ovules 2 (rarely 4) in each cell, pendent from near the apex of the cells; seeds large.

Alkaline or wet places in high mountains, 5000 to 7000 feet, rare: San Bernardino Mts.; Sierra Co., Sierra Nevada. Nevada to Washington. Apr.

Locs.—Bear Valley, San Bernardino Mts., *Parish* 1792; Sierraville, *Lemmon.*

Refs.—DRABA DOUGLASII Gray, Proc. Am. Acad. 7:328 (1868), type loc. divide between East Carson and West Walker rivers, *Anderson. Braya oregonensis* Gray, Proc. Am. Acad. 17:199 (1882), type loc. Union Co., Ore., *Cusick;* Parish, Erythea 3:60 (1895). *D. crockeri* Lemmon, Bull. Torr. Club 16:221 (1889), type loc. Sierra Valley, *Lemmon.*

33. ATHYSANUS Greene

Low annual, leafy below, the short stem divided at or near the base into few or many simple elongated filiform branches or racemes which are unilaterally flower-bearing throughout. Herbage pubescent with 2 to several-forked spreading hairs. Flowers minute, promptly reflexed or recurved. Petals linear or none. Stamens 6, nearly or quite equal; filaments slender. Pod small, orbicular, indehiscent, or dehiscent only after falling, 1-celled, or 2-celled by a thin partition, wingless; cotyledons accumbent.—Species 1, Pacific Coast of North America. (Greek a-, without, and thusanos, fringe, the fruit wingless, the type species taken out of the genus Thysanocarpus, the fruit of which is broadly margined.)

1. **A. pusillus** Greene. Plants 4 to 12 inches high; branches ascending; racemes 3 to 9 inches long; leaf-blades broadly oblong, entire or with 1 to 3 coarse teeth on each side, 2 to 5 (or 12) lines long; flowers ⅔ line long, on pedicels twice as long; ovary 1-celled; ovules 2 to 4, only one maturing, that attached at base of the pod; fruiting pedicels recurved, 1 to 3 lines long; pods orbicular, strongly flattened, ¾ to 1 line long, hispid all over with hooked hairs.

Gravelly plains and foothills, 50 to 4000 feet: cismontane Southern California; Sierra Nevada from Fresno Co. to Modoc Co.; Coast Ranges from southwestern Fresno Co. to Trinity Co.; Sacramento Valley. Northerly to British Columbia and Idaho. Common. Apr.-May.

Note on variation.—Plants with pods that are glabrous, or ciliate on the margins with glabrous faces, are sometimes found growing in shade in the San Francisco Bay region. A collection of specimens made in the Berkeley Hills, *Tracy* 1346, has among them plants with some pods hirsute, some ciliate only, and others glabrous, all on one individual.

Locs.—S. Cal.: San Diego, *K. Brandegee;* Laguna Mts., *Peirson;* Ramona, San Diego Co.; Hot Springs Mt., near Warners Hot Sprs., *Jepson* 8740; San Bernardino, *Parish;* Mt. Wilson, *Peirson* 60a (racemes not unilateral); Santa Cruz Isl. Tehachapi Mts.: Rowen, *Jepson* 6714. Sierra Nevada: Pine Ridge, Fresno Co.; Vernal Fall, Yosemite, *Jepson* 10,458; Rough and Ready, Nevada Co., *Jepson* 13,394; lava beds, Modoc Co., *R. M. Austin.* Coast Ranges: Zapato Chino Creek, sw. Fresno Co., *Jepson* 15,369; Halls Valley, Mt. Hamilton Range, *Jepson* 8240; Corral Hollow, *Jepson* 9584; San Francisco, *Greene;* Berkeley, *Jepson* 13,393; Antioch; Lagunitas, Marin Co., *Eastwood;* Vaca Mts., *Platt;* Lodoga, w. Colusa Co., *Jepson* 16,277; Ukiah, *Purdy;* Mail Ridge, s. Humboldt Co., *Jepson* 1901; Southfork Mt., w. Trinity Co., *Jepson* 16,658. Sacramento Valley: College City, *Alice King;* Rosewood, Tehama Co., *Jepson* 178d; Anderson, Shasta Co., *Alice King;* Palo Cedro, Shasta Co., *Blankinship.*

Refs.—ATHYSANUS PUSILLUS Greene, Bull. Cal. Acad. 1:72 (1885); Jepson, Fl. W. Mid. Cal. 224 (1901), ed. 2, 190 (1911), Man. 446, fig. 437 (1925). *Thysanocarpus pusillus* Hook. Ic. Pl. 42 (1836), type loc. "Monterey," *Douglas. A. pusillus* var. *glabrior* Wats.; Gray, Syn. Fl. 1^1:113 (1895), type loc. Ft. Mohave, Ariz., *Lemmon,* fruit glabrous but ciliate on the margins.

34. **THYSANOCARPUS** Hook.

Slender erect annuals with the stems commonly sparingly branched or often simple. Flowers minute, white or purplish. Sepals ovate, spreading. Petals spatulate. Stamens 6, subequal, with slender filaments. Ovary 1-celled, 1-ovuled, becoming an indehiscent fruit. Pod much flattened and winged, orbicular in outline, the body disk-shaped or plane on one side and convex on the other, the wing entire or toothed, with or without radiating nerves ("rays"), or with small holes or perforations.—Species about 5, western North America. (Greek thusanos, fringe, and karpos, fruit.)

Fruiting pedicels more or less recurved their whole length; rays of the wing broad.
  Leaves oblong-lanceolate to linear, the basal rosulate, pinnatifid or toothed........1. *T. curvipes.*
  Leaves linear to oblong-linear, the basal entire or with divaricate salient segments, not rosulate........2. *T. laciniatus.*
Fruiting pedicels straight or recurved only at tip; rays of the wing linear........3. *T. radians.*

1. **T. curvipes** Hook. FRINGE-POD. Slender, 1 to 1½ feet high, more or less pubescent or hirsute; blades of cauline leaves linear or lanceolate, sessile and auricled at base, the upper entire, the lower dentate or denticulate; basal leaves often narrowed at base to a petiole, the blades commonly sinuate-pinnatifid, with triangular acute or acuminate lobes; pods obovate, varying to round-obovate, pubescent or glabrous, 1½ to 3½ lines long, often very convex on one side; wing narrow, rather crowded with broad rays, entire.

Open hill country, 100 to 5000 feet: cismontane region, widely distributed and everywhere frequent for the most part. North to British Columbia and Idaho. Mar.-May.

Note on variation.—The wings of the fruit in this species are usually non-perforate, but plants are not infrequently found in which some of the fruits exhibit slightly perforate wings (as in Corral Hollow, *May Arnold*) or mainly perforate (Yosemite, *Jepson* 10,451). While fruits with broad conspicuously perforate wings characterize the var. elegans Rob., this variety, per contra, sometimes exhibits non-perforate wings, or wings with merely translucent spots.

Locs.—Sierra Nevada: Auburn, *Sonne;* Freeport, Sacramento Co., *Bolander* 4505; Pine Log, South Fork Stanislaus River, *A. L. Grant* 702; Italian Bar, Tuolumne Co., *A. L. Grant* 12a; Yosemite Valley, *Jepson* 100f; Kinsley, Mariposa Co., *Charlotte Hoak;* Pinehurst, near Millwood, Fresno Co., *Newlon* 196; Bear Mt., Tehachapi Mts., *Jepson* 7164. Coast Ranges: Dunsmuir, Siskiyou Co., *Heller* 7931; Anderson, Shasta Co., *Alice King;* Gasquet, Del Norte Co., *Howell* 1412; Klamath River, Humboldt Co., *Chandler* 1444; Weaverville, *Yates* 106; Van Duzen River valley, opp. Buck Mt., Humboldt Co., *Tracy* 4092; Mad River Valley, Trinity Co., *Tracy* 4304; Paskenta, sw. Tehama Co., *Jepson* 16,327; Scotts Valley, Lake Co., *Tracy* 1739; Calistoga, *Jepson* 27d; St. Helena, *Jepson* 30e; Mt. George, Napa Co., *Jepson* 30d; Peaceful Glen, nw. Solano Co., *Jepson* 9626; Vacaville, *Jepson* 26c; Gates Cañon, Vaca Mts., *Jepson* 26d; Mt. Tamalpais, *Jepson* 7561; Arroyo Mocho, Alameda Co., *J. T. Howell* 818; Smith Creek, Mt. Hamilton, *R. J. Smith;* Livermore, *Jepson* 28d; Guadalupe Mine, Santa Clara Co., *Jepson* 9089; San Miguel, *Jepson* 8439; Zapato Chino Creek, sw. Fresno Co., *Jepson* 15,373; Fort Tejon, *Davy* 2359. S. Cal.: Saugus, *Davy;* Arroyo Seco (hills w.), *Peirson* 388; Monrovia Cañon, San Gabriel Mts., *J. T. Howell* 3767 (rays very narrow); San Bernardino, *Parish;* Saunder Mdw., San Jacinto Mts., *C. V. Meyer* 182; Santa Cruz Isl., *Frida Sexauer* (some fruits with perforate wings).

Var. **elegans** Rob. LACE-POD. Stem rather stout, with few branches, 14 to 30 inches high; blades of lower leaves repand-toothed or entire; pods nearly orbicular, 3 to 4½ lines long, the body densely tomentose or glabrous; wing with large ovoid perforations between the rays (or sometimes non-perforate), the margin membranous and entire.—Foothills throughout cismontane California.

Locs.—Sierra Nevada foothills: Alder Creek near Folsom, *Alice King;* Linden, *Gunnison;* Knights Ferry, *F. W. Bancroft;* Bootjack, Mariposa Co., *Jepson* 12,781, 12,791; Table Mt., Fresno Co., *Jepson* 15,124; Old Colony Mill, Sequoia Park, *Jepson* 620. Great Valley: Redding, *Blankinship;* Crane Creek, Tehama Co., *Jepson* 30g; College City, *Alice King* (wing non-perforate but with translucent spots); Marysville Buttes, *Jepson;* Stockton, *Sanford* 195. Coast Ranges: Round Valley, ne. Mendocino Co., *Goddard* 620; Long Valley, Mendocino Co., *Jepson* 2198a; Scotts Valley, Lake Co., *Tracy* 1655; St. Helena, *Jepson* 9895; Walker Cañon, Vaca Mts., *Jepson* 30j; Summerville, Contra Costa Co., *Chesnut & Drew;* Mt. Diablo, *Jepson* 5g, 9666 (wing non-perforate); Brentwood, *Linda Gehringer;* Mt. Hamilton, *R. J. Smith;* San Martin, Santa Clara Co., *Chandler* 900; Santa Margarita, *Jepson* 11,977. S. Cal.: Manzana, Antelope Valley, *Davy* 2540; Escondido, *C. V. Meyer* 102; Cuyamaca.

Var. **emarginatus** Jepson comb. n. Cauline leaves auricled or sometimes not auricled; pods nearly circular, 2 to 2½ lines long, glabrous (rarely pubescent), the wing scarious, destitute of radiating nerves or these very short, deeply or slightly emarginate at the apex.—Open or openly wooded foothills: Inner Coast Range; Sierra foothills from Calaveras Co. to Madera Co.

Locs.—Crane Creek, w. Tehama Co., *Jepson* 178b; Gwin Mine, Calaveras Co., *Jepson* 1784; Fresno Flats, *Jepson* 12,849; Mt. Diablo, *Jepson* 5h, 9666; Mt. Day, Santa Clara Co., *R. J. Smith;* Morgan Hill, *Jepson* 80c (a transition to T. laciniatus); San Emigdio Cañon, *Davy* 2048a.

Var. **cognatus** Jepson var. n. Herbage nearly glabrous, a little glaucous; blades of cauline leaves entire or nearly so; pods orbicular-elliptic, abruptly contracted to a shortly cuneate base, 3 lines long, not notched at apex or only slightly.—(Fere glaber, glauciusculus; folia caulina subintegerrima integerrimave; siliquae orbiculato-ellipticae, basi breviter cuneata (lin. 3 longa) abrupte contractae, ad apicem fere integerrimae.)—Pine Log, South Fork Stanislaus River, *A. L. Grant* 702 (type); Lake Eleanor, Tuolumne Co., 4690 feet, *A. L. Grant* 1257.

Var. **longistylus** Jepson. Style ½ to ¾ line long (in the species ⅛ to ⅕ line long), persistent.—Sierra Nevada, 3000 to 3500 feet, from Mariposa Co. to Tulare Co.

Locs.—Hetch-Hetchy, *Bioletti;* Yosemite Valley, *Jepson* 80b; Tulare Co. foothills, *Jepson* 13,383.

Refs.—THYSANOCARPUS CURVIPES Hook. Fl. Bor. Am. 1:69, t. 18 f. A (1830), type loc. Great Falls, Columbia River, *Douglas;* Jepson, Fl. W. Mid. Cal. 225 (1901), ed. 2, 191 (1911), Man. 447, fig. 438 (1925). Var. *involutus* Greene, Fl. Fr. 276 (1891), type loc. Sonoma Co., *Bioletti*. Var. *pulchellus* Greene, l.c., type loc. mid. Cal. *T. hirtellus* Greene, Pitt. 3:86 (1896), type loc. Dry Creek, Napa Co., *Greene*. *T. affinis* Greene, Pitt. 4:311 (1901), type loc. Santa Catalina Isl., *Trask*. *T. desertorum* Hel. Muhl. 2:47 (1905), type loc. Randsburg, Kern Co., *Heller* 7681. *T. foliosus* Hel. l.c., type loc. Girard, Kern Co., *Heller* 7719. Var. ELEGANS Rob.; Gray, Syn. Fl. 1^1:114 (1895); Jepson, Man. 447 (1925). *T. elegans* F. & M. Ind. Sem. Hort. Petrop. 2:51 (1835), type from Cal.; Hooker, Ic. Pl. t. 39 (1836); Jepson Fl. W. Mid. Cal. 225 (1901), ed. 2, 191 (1911). *T. curvipes* B. & W. Bot. Cal. 1:48 (1876), in part. *T. ramosus* Greene, Bull. Cal. Acad. 2:390 (1887), type loc. Santa Cruz Isl., *Greene*. Var. EMARGINATUS Jepson. *T. laciniatus* var. *emarginatus* Jepson, Man. 447 (1925). *T. emarginatus* Greene, Pitt. 3:86 (1896), type loc. summit of Mt. Diablo, *Greene;* Jepson, Fl. W. Mid. Cal. 225 (1901), ed. 2, 191 (1911). Var. COGNATUS Jepson. Var. LONGISTYLUS Jepson, Man. 447 (1925), type loc. foothills of Tulare Co., *Jepson* 13,383.

2. **T. laciniatus** Nutt. SOUTHERN LACE-POD. Stem 8 to 15 inches high; herbage glabrous or the stems sometimes sparingly hirsutulose; leaves thinner than in no. 1, those near the base not forming a dense or persistent rosette; leaf-blades narrowly linear or elongated-linear, subentire, saliently and remotely slender-toothed, or deeply pinnatifid into remote narrowly linear segments; cauline leaves without auricles or only slightly auricled; racemes 1 to 8 inches long; pods obovate or elliptic, contracted to a shortly cuneate base or sometimes the base almost stipelike, distinctly reticulated, commonly but not always glabrous, 1 to 2 lines long; wing entire or crenate-toothed, destitute of rays; pedicels slender, spreading and deflexed.

Open hills, 50 to 1500 feet: coastal Southern California. South to Lower California. Mar.-May. It passes by intergrades into T. curvipes var. emarginatus.

Locs.—Yridisis Creek, Santa Inez Mts., *Jepson* 11,920; Elizabeth Lake, Antelope Valley; Ojai, *F. W. Hubby* 51; Santa Monica hills, *Brewer* 196; Big Tujunga Cañon, San Gabriel Mts., *Peirson* 599; Millards Cañon, San Gabriel Mts., *Peirson* 59; San Bernardino foothills, *Parish;* Winchester, Riverside Co.

Var. **crenatus** Brew. Wing notched between the ends of the rays.—South Coast Ranges and coastal Southern California.

Locs.—Mt. Day, Santa Clara Co., *R. J. Smith;* Alum Rock, Santa Clara Co., *Pendleton* 682; San Emigdio Cañon, *Davy* 2048; Escondido, *C. V. Meyer* 87.

Var. **eremicola** Jepson nom. n. Leaves moderately toothed or subentire, the cauline not auricled or only moderately auricled; pods suborbicular, not cuneate at base, 2 to 2½ lines long, the wing membranous, without rays.—West side of the Colorado Desert and north to Inyo Co.

Locs.—Vallecito Cañon, e. slope Laguna Mts., *Peirson* 5942; Blair Valley, e. San Diego Co., *Jepson* 8692; Andreas Cañon, Palm Sprs., Mt. San Jacinto, *Newlon* 439; Murray Cañon, Mt. San Jacinto, *Parish* 20,015; Hesperia, *Newlon* 469a; Ord Mt., Mohave Desert, *Hall & Chandler* 6802; Black Mts., Death Valley, *J. T. Howell* 3661; Hanaupah Cañon, Panamint Range, *Jepson* 7040; Independence, *S. W. Austin* 450.

Var. **conchuliferus** Jepson. Four to 8 inches high; herbage glabrous, glaucous; leaf-blades linear or lance-linear, sagittate-auriculate, runcinately toothed or parted; teeth 2 to 4 pairs; racemes densely many-flowered, 1 to 2 inches long; pedicels 2 to 3 lines long, spreading, little recurved; pods markedly boat-shaped, glabrous; wing parted into spatulate lobes, or the lobes coherent above, leaving oblong perforations.—Santa Cruz Isl.

Refs.—THYSANOCARPUS LACINIATUS Nutt.; T. & G. Fl. 1:118 (1838), type loc. Santa Barbara, *Nuttall.* Var. CRENATUS Brew.; B. & W. Bot. Cal. 1:49 (1876); Jepson, Man. 447 (1925). *T. crenatus* Nutt.; T. & G. Fl. 1:118 (1838), type loc. Santa Barbara, *Nuttall. T. ramosus* Greene, Bull. Cal. Acad. 2:390 (1887), type loc. Santa Cruz Isl., *Greene.* Var. EREMICOLA Jepson. *T. curvipes* var. *eradiatus* Jepson, Man. 447 (1925), type loc. Hanaupah Cañon, Panamint Mts., *Jepson* 7040. Var. CONCHULIFERUS Jepson, Man. 447 (1925). *T. conchuliferus* Greene, Bull. Torr. Club 13:218 (1886), type loc. Santa Cruz Isl., *Greene* (Pitt. 1:31,—1887). *T. conchuliferus* var. *planiusculus* Rob.; Gray, Syn. Fl. 1^1:113, type loc. Santa Cruz Isl., *T. Brandegee.*

3. **T. radians** Benth. SPOKE-POD. Stems ½ to 1½ feet high; blades of basal leaves runcinate-pinnatifid, blades of the cauline ovate-lanceolate, auriculate-clasping; pods orbicular, 4 lines broad, glabrous or tomentose, the edge of the body divided into radiating spoke-like nerves which disappear abruptly just within the margin of the white-membranous wing; pedicels straight, spreading, abruptly recurved at the very summit.

Low hills or rolling plains, 100 to 3000 feet: infrequent, but widely distributed in the North Coast Ranges and Sacramento Valley and bounding foothills. Apr.-May.

Occurrence in the English foothills of the Vaca Mts.—On the gentlest slopes of the lowest foothills this species has a characteristic occurrence. In wild or semi-wild land it is often abundant. In one area of forty acres it was found in colonies 5 to 20 feet across, the plants standing so thickly as to make pinkish or pale straw-colored spots on the grassy slopes. No two colonies, it was noted, were exactly alike. Sometimes the differences were striking, one colony being composed exclusively of individuals with white-winged fruits, others exclusively of individuals with pink-winged fruits. Some colonies exhibited only glabrous fruits, others only pubescent fruits. Other differences were slight and related to habit or leafage.

Locs.—Fall River Valley, *M. S. Baker;* Yreka, *Butler* 1146; Reed road, Shasta Co., *M. S. Baker;* Anderson, Shasta Co., *Blankinship;* Round Valley, Mendocino Co., *Westerman;* Healdsburg, *Alice King;* Violet sta., Solano Co., *Jepson* 1200a; Vacaville, *Jepson* 30h; St. Helena, *Jepson* 534; Mt. George, Napa Range, *Jepson* 30n; Sacramento, *M. S. Baker;* Freeport, *Bolander* 4504; Penn Valley, Nevada Co., *Jepson* 30i; Roseville, Placer Co., *Alice King;* Willow Springs sta., Sacramento-Jackson road, *Jepson* 15,255; Clements, ne. San Joaquin Co., *Jepson* 15,200.

Refs.—THYSANOCARPUS RADIANS Benth. Pl. Hartw. 297 (1857), type loc. plains near junction of Yuba and Feather rivers, Sacramento Valley, *Hartweg* 211 (cf. Erythea 5:59); Jepson, Fl. W. Mid. Cal. 225 (1901), ed. 2, 191 (1911), Man. 447, fig. 439 (1925). *T. radians* var. *montanus* Jepson, Fl. W. Mid. Cal. 226 (1901), type loc. Mt. George, Napa Range, *Jepson* 30n; wing of fruit bright purple.

SARRACENIACEAE. Pitcher Plant Family

Herbs. Leaves basal, with pitcher-like petioles and lid-like blades, the cavity containing a liquid with properties sometimes similar to gastric juice. Flowers borne on a scape. Sepals 5, persistent. Petals 5. Stamens many. Ovary superior, 3 to 5-celled. Fruit a loculicidal capsule. Seeds numerous.—Genera 3 and species 9, only in the New World (British Guiana, eastern North America, California and Oregon).

1. DARLINGTONIA Torr.

Scapes 1-flowered, the flower pendulous. Petals with a small ovate tip (the blade) and a larger elliptic or oblong lower portion (the claw). Sepals rotate. Stamens 13 to 15, in a single circle. Stigmas 5, rotate on a short style which arises from the umbilicate-truncate apex of the ovary.—Species 1. (William Darlington, 1782–1863, Pennsylvania botanist.)

Bibliog.—Torrey, John, On the Darlingtonia californica, a new Pitcher Plant from northern California (Smithsonian Contrib. 6:1–8, pl. 12,—1853). Gray, A., Darlingtonia californica Torr. (Am. Jour. Sci. ser. 2, 16:425,—1853; 33:136–137,—1863). Anon., The California Pitcher

Plant (Scientific Press 21:222,—1870). Lemmon, J. G., Darlingtonia californica (Pac. R. Press 2:249,—1871). Canby, W. M., Darlingtonia californica, an insectivorous plant (Proc. Am. Assoc. Adv. Sci. 23: B64,—1875); Darlingtonia californica, eine Insektenfresserin (Oster. Bot. Zeitschr. 25:287–293,—1875). Edwards, Henry, Darlingtonia californica (Proc. Cal. Acad. 6: 161–166,—1875). Hooper, E. J., Possibly a new species of Darlingtonia californica (Cal. Horticulturist 9:13,—1879). Howell, Thos., Distribution of Darlingtonia in Oregon (Erythea 3:179,—1895). Robinson, W., The California Pitcher Plant (Flora and Sylva 3:230,—1905).

1. **D. californica** Torr. California Pitcher Plant. Calf's Head. (Fig. 144.) Plants greenish-yellow, ⅔ to 1¼ (or 3) feet high; leaves enlarged upward into a rounded hood, one side of the hood with a circular orifice covered above by a 2-forked appendage; sepals yellowish-green with irregular purplish lineations, 1⅜ to 2 inches long; petals dark purple, heavily veined, narrow-ovate, 1⅛ to 1¼ inches long; stamens 3 lines long; ovary cuneate-obovoid; capsule obovatish-oblong, 1 to 1⅛ inches long.

Marshy meadows and along streams, 3000 to 6000 feet: Nevada and Plumas Cos.; Siskiyou, Trinity and Del Norte Cos. North along the Oregon Coast Range (sometimes near sea-level) as far as Coquile Pt. Apr.-June.

Biol. note.—Darlingtonia californica is gregarious and inhabits boggy spots in wet meadows or along streams. It has its greatest development in the Coast Mts. of Curry and Josephine counties, Oregon, where the plants grow very rankly along streams. E. W. Hilgard once told us that the domed pitchers used to strike him in the face as he walked through the thickets of these plants on the Illinois River in 1888, although in our own northern journeys we have never seen them so tall. The sepals spread rotately but the petals converge to the tips by their edges so as to form a tubular crown to the essential organs. A little above the middle of the petal there is a constriction of it in such a way that contiguous petals form a circular "hole" or entrance, there being thus five such in a circle.

The appendages of the hood are somewhat twisted. A fly alights upon the tip of an appendage; in traveling along it he is thus brought by the under surface of the appendage to the orifice, and encouraged, it is thought, to enter the hood on account of the illuminated "windows" or somewhat transparent areas in the tissue opposite the opening. The bottom of the pitcher usually carries a liquid and, since the hairs on its side point downward, the egress of an insect is rendered more difficult.

The first field observations and experiments were made upon this plant by Rebecca M. Austin during the years 1873 to 1878 while residing in Butterfly Valley in Plumas Co. She discovered and mapped the distribution of the nectar exudation upon the pitchers; detected the fluid in the bottom of the closed pitchers and hence identified it as a secretion of the plant; noticed that this fluid increased on the capture of insect prey, and that the increase was even greater when raw meat was introduced into the pitchers. She determined to her own satisfaction that the pitcher fluid has no digestive power, but that decomposition rather than digestion takes place. Two other interesting facts were worked out by this observer, namely that the entrance of rain water is precluded by the pitcher structure, and that the age of an individual plant corresponds to the number of old leaf bases attached to the rootstock (cf. F. M. Jones, Dec. 9, 1932, in Austin Corr. ms.).

Flies in greater or less number are usually found in the bottom of the pitcher and their decay renders the mass fetid. As long ago as 1875, the entomologist, Henry Edwards, identified as many as 43 species of insects (representing every natural order of Insecta) that had been trapped by the pitchers. Aside from insect victims, there are two insect species regarded as associates of Darlingtonia, namely Metriocnemus edwardsii Jones and Botanobia darlingtoniae Jones (Entomological News 27:385).

Under conditions that simulate its natural habitat, Darlingtonia has been successfully cultivated. There is required a cold half-shady situation, constant moisture, and a compost made of peat, sphagnum, coarse sand and gravel with shale or broken rock to insure perfect drainage.

Locs.—Moore's Flat, Nevada Co. (Scientific Press 21:222); Lake City, Nevada Co. (Pflzr. 4^{110}:26); Black Hawk Creek, Quincy (Pac. Rur. Press 2:249); Cold Sprs., Butterfly Valley, *R. M. Austin;* Mt. Shasta (n. side), *H. E. Brown* 389; Castle Crags, *Arthur Green;* Cantara, Horseshoe Bend, upper Sacramento River, *Jepson* 13,448; Castle Lake, Trinity Mts., *M. S. Baker;* Mt. Eddy, *Copeland* 3812; Bear Creek, Trinity Co., *Alexander & Kellogg* 314; Salmon Mts., many meadows on the south slope; Willis Hole, Kelsey trail, Siskiyou Mts., *Jepson* 2868; betw. Big Flat and Bald Mt., Del Norte Co., *Jepson;* Adams sta., headwaters of Shelley Creek, Del Norte Co., *Jepson.* Oregon: West Fork Illinois River, *Jepson;* Waldo, *Howell;* Kerbyville, *Howell.*

Refs.—Darlingtonia californica Torr. Smithson. Contrib. 6:5, t. 12 (1853), type loc. upper Sacramento River, *J. D. Brackenridge & G. W. Hulse;* Jepson, Man. 448, fig. 440 (1925).

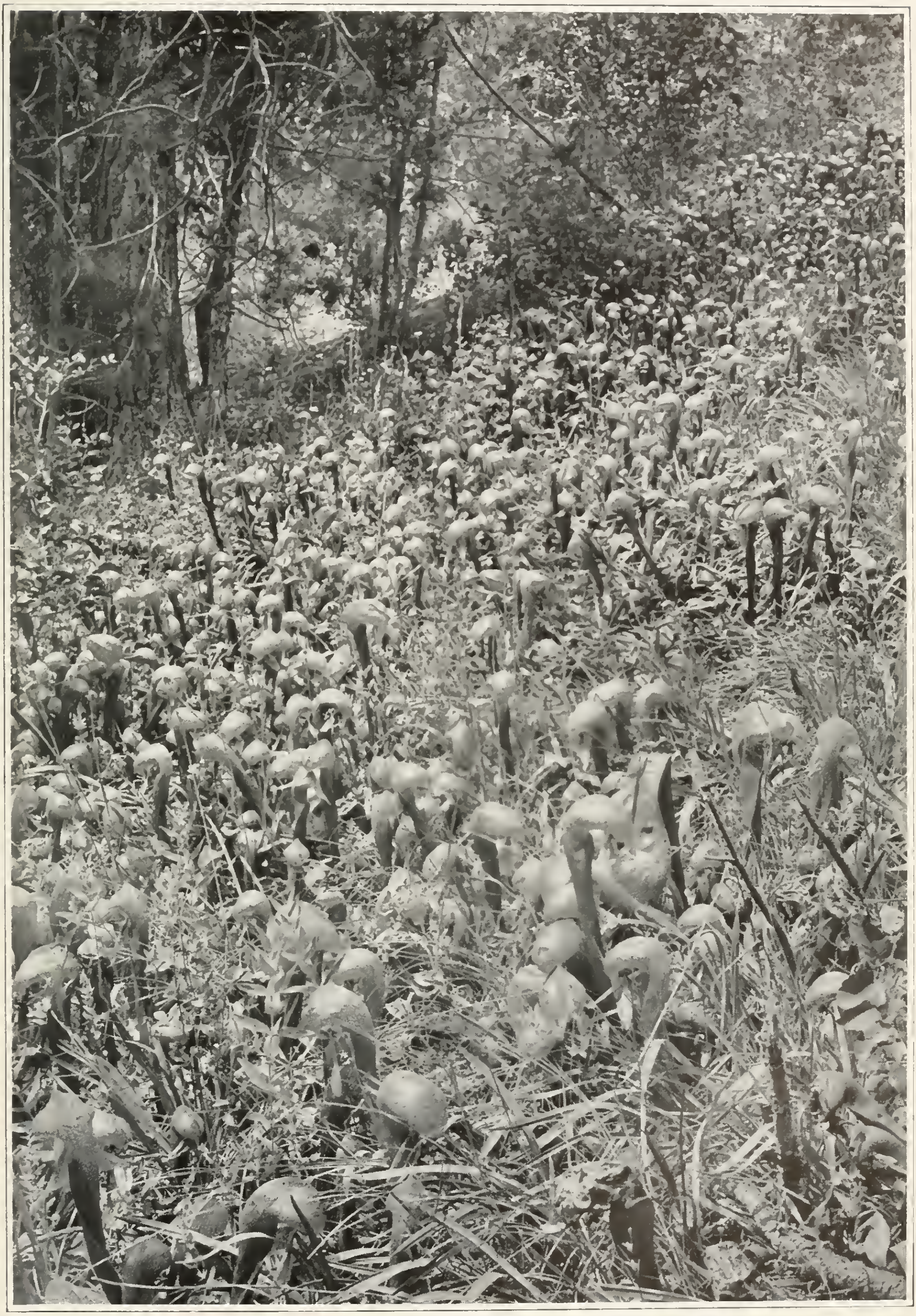

Fig. 144. Darlingtonia californica Torr. Colony of California Pitcher Plants in an open swale near Keddie, Plumas County, Sierra Nevada, c. 3300 feet. (H. S. Lawton, photo.).

DROSERACEAE. Sundew Family

Perennial glandular herbs of bogs. Leaves in a basal rosette. Flowers hypogynous, white. Ovary 1-celled; styles 1 to 5; ovules numerous on parietal placentae. Capsule 3-valved.—Genera 6, species 106, temperate and subtemperate regions of all continents.

Bibliog.—Darwin, Chas., Insectivorous plants (1–376), figs. 1–30, ed. 2, 1899). Diels, L., Droseraceae (Engler, Pflzr. 4^{112}:136, figs. 1–40, map,—1906).

1. DROSERA L. Sundew

Herbage brownish or reddish. Leaves long-petioled, the blade covered with numerous stout glandular hairs. Flowers borne on a naked scape in a 1-sided raceme. Calyx 5-parted, persistent. Petals 5, distinct or slightly united, hypogynous. Stamens 5. Styles 2 to 5, usually 3, often 2-parted so as to appear twice as many.—Species 90, all continents but most abundant in Australia. (Greek droseris, dewy, the glands dew-like.)

Biol. note.—The numerous glandular hairs occur on the margins and in the middle of the leaves. When small animals become entangled by the glands, the hairs and the entire leaf close over them, dissolving and absorbing all the digestible material. The leaf then slowly re-opens, the rejected or indigestible matter dries and is blown away, and the organ is ready to repeat the operation.

Leaf-blades orbicular or broader than long............1. *D. rotundifolia.*
Leaf-blades 4 to 8 times longer than broad............2. *D. longifolia.*

1. **D. rotundifolia** L. Common Sundew. Scapes 3½ to 8 inches high; leaf-blades spreading, suborbicular; petals only a little exceeding the sepals.

Cold bogs or swamps: Sierra Nevada, 3600 to 8500 feet, from Tulare Co. to Siskiyou Co., thence south (near the coast, 300 to 4000 feet) to Sonoma Co. North America, Europe, Asia. July-Aug.

Locs.—This species is, probably, of more frequent occurrence in the swampy meadows of the Sierra Nevada than has been recorded. In the Giant Forest, Sequoia Park, it occurs in several of the meadows but the conditions in the various meadows are somewhat different. Judge Walter Fry assures us that the plants bloom every year in Oriole Mdw., but only once in two or three years in Crescent Mdw. We cite other stations as follows: Huckleberry Mdw., Giant Forest, Tulare Co., *Newlon;* Grouse Mdw., Middle Fork Kings River, acc. *F. W. Peirson;* Frenchman Mdw., Dorrington, Calaveras Co., *Jepson* 10,185; Kneeland's Mill, Nevada Co., *Sonne;* Coldstream, Placer Co., *Sonne* 107; Willow Lake, Plumas Co., *R. M. Austin* 369; Mineral, Tehama Co., *J. Grinnell;* Bear Valley Mts., Modoc Co., *Baker* 555; Dead Horse Cañon, Siskiyou Co., *M. S. Baker;* Mt. Shasta (N. Am. Fauna 16:147); Christmas Prairie, Humboldt Co., *Alma Bonstell;* Bald Mt., betw. High Prairie and Snow Camp, Humboldt Co., *Tracy* 4601; Humboldt Hill, *Tracy* 5084; Albion, Mendocino Co., *Davy & Blasdale;* Pitkin swamp, Graton, Sonoma Co., acc. *M. S. Baker.*

Refs.—Drosera rotundifolia L. Sp. Pl. 281 (1753), "Europe, Asia, America"; Jepson, Man. 449, fig. 441 (1925).

2. **D. longifolia** L. Arctic Sundew. Scapes 3 to 6 inches high; leaf-blades erect, obovate-spatulate; petals nearly twice as long as the sepals.

Marshy spots or bogs in the mountains, 5000 to 6000 feet: Sierra Co. North to British America. Europe, Asia. July.

Loc.—Sierra Co. (Bot. Cal. 1:213).

Refs.—Drosera longifolia L. Sp. Pl. 282 (1753), type European; Jepson, Man. 449 (1925). *D. anglica* Huds. Fl. Angl. ed. 2, 135 (1778).

CRASSULACEAE. Stone-crop Family

Ours glabrous succulent herbs. Leaves entire, without stipules. Flowers in cymes or rarely solitary, small, regular, and usually perfect. Sepals, petals and pistils of the same number (usually 5 in ours), the stamens as many or twice as many. Petals distinct or united at base into a short tube, usually persistent. Pistils placed opposite the petals. Fruit superior, consisting of free or somewhat united one to many-seeded follicles. Receptacle usually with nectar-bearing scales, one behind each pistil.—Genera 13 and species about 500, all continents, but most strikingly and abundantly developed in South Africa.

Geographic distribution of the family in California.—The north temperate species Rhodiola rosea L. is represented in California by the var. integrifolia Jepson. It is our only strictly alpine species. The greater part of our species belong to the lowest life zones, the lower and upper Sonoran. Of endemic genera limited to California we have two, namely Sedella, which inhabits the lower Sierra Nevada foothills and similar foothills in the Napa Range, and the peculiar Congdonia which thus far has been found only on the east slope of the Sierra Nevada in Mono County at 8000 feet. This station is therefore a habitat of considerable actual elevation but ecologically it represents a mountain slope strongly influenced by desert conditions. The genus Hasseanthus may be considered as a derivative from Sedum in which the rootstock has been shortened and thickened into a tuber, a resting adaptation suited to the long rainless season of its habitats where the soil becomes extremely hard and desiccated.

Our remaining genera are more or less cosmopolitan, especially Tillaea, which is limited to low altitudes, the lower foothills and valley flats. The species T. erecta, a habitant of sandy soils or spots of fine gravel destitute of other vegetation, is the most wide-spread species of the family in California and in number of individuals vastly surpasses any other. The species of Sedum occur from near sea-level to altitudes of 4000 to 7000 feet, or some of them range as high as 10,000 to 12,000 feet, and are widely distributed. This genus has thus a greater altitudinal range than any other genus of this family in California. The genus Echeveria is represented by species of the low plains and foothills or of lower altitudes in the mountains—all of them plants of dry or rocky habitats.

Bibliog.—Baker, J. G., Genus Cotyledon (Saunders, W. W., Refugium Botanicum 1:pl. 56–72,—1869). Britton, N. L., and Rose, J. N., New or Noteworthy N. Am. Crassulaceae (Bull. N. Y. Bot. Gard. 3:1–45,—1903); Crassulaceae in N. Am. Fl. 22:7–74 (1905). Gunthart, A., Beiträge zur Blutenbiologie der Crasulaceen (Biblio. Bot. 11^{58}:39–62,—1902). Nelson, A., & Macbride, J. F., Cotyledon and its segregates (Bot. Gaz. 56:475–477,—1913).

Leaves opposite; stamens as many as the petals; diminutive annuals.......1. TILLAEA.
Leaves alternate; stamens twice as many as the petals.
    Annuals; carpels 1-seeded, the ventral margin with a glandular fringe.......2. SEDELLA.
    Perennials; carpels several to many-seeded, without a ventral fringe.
        Flowers solitary; root tuberous.......3. CONGDONIA.
        Flowers many, in cymes.
            Flowering stems arising from corms.......4. HASSEANTHUS.
            Flowering stems not arising from corms.
                Flowers imperfect; flowering stems arising from a short caudex; leaf-rosettes none.......5. RHODIOLA.
                Flowers perfect; flowering stems arising from leaf-rosettes.
                    Petals commonly spreading, at least at tip; mostly mat-like plants with branching rootstocks.......6. SEDUM.
                    Petals commonly erect, often closely approximate at tip; coarse plants with thick basal leaf-rosettes borne on a simple or branched caudex.......7. ECHEVERIA.

1. TILLAEA L.

Diminutive much-branched glabrous annuals with opposite leaves. Flowers minute, clustered or solitary in the leaf-axils, subsessile to long-pediceled. Sepals, petals, stamens, and carpels 3 to 5 (in ours usually 4). Petals distinct, or united only at the very base. Carpels distinct, erect, 1 to 12-seeded.—Species about 20, distributed over the entire earth. (Michael Angelo Tilli, Italian Botanist, 1655–1740.)

Flowers solitary in the axils; petals twice the length of the sepals; carpels 8 to 10-seeded; aquatic or of muddy bottoms.......1. *T. aquatica.*
Flowers densely clustered in the axils; petals and sepals subequal; carpels 1 or 2-seeded; terrestrial.......2. *T. erecta.*

1. **T. aquatica L.** WATER PIGMY. Stems usually decumbent and rooting at the lower nodes, branched, 1 to 3 inches long; leaves linear-oblong, 2 to 3 lines long, connate at base; flowers sessile or short-pedicellate; sepals ½ line long, twice exceeded by the petals; petals white, oblong, navicular; carpels 8 to 10-seeded.

Muddy ground, 50 to 1500 feet: widely distributed in California but very inconspicuous and perhaps not common. North America, Europe. Mar.-Apr.

Locs.—Alton, Humboldt Co., *Tracy* 3689, 4705; Napa, *Jepson* 13,442; Vacaville, *Jepson* 1204; Stockton, *Sanford;* San Diego, *Orcutt.*

Var. **drummondii** Jepson. Lower pedicels elongating in fruit and finally exceeding the leaves, the upper ones remaining shorter than the leaves.—Muddy places, central California. North to Washington, east to Louisiana, south to Mexico, western United States.

Note on variation.—Specimens from San Mateo Co. (Lake Pilarcitos, *Bioletti*) show on single individuals pedicels varying from 3¼ times as long as the leaves to twice as long, 1½ times as long, equaling the leaves or (especially towards the ends of the branches) shortly pediceled or subsessile. This condition is more or less repeated in all the specimens which we cite: Pudding Creek, Ft. Bragg, *Ottley* 1554; Calistoga, *Tracy* 1854½; Presidio, San Francisco, *Bioletti;* Tres Pinos, San Benito Co., *Jepson* 16,117. While the flowers usually have 4 stamens alternate with the petals and about as long as the carpels, in plants on the Madera plains (Califa, *Jepson* 15,173), we find a second whorl of 4 stamens opposite to and about ⅔ as long as the petals with anthers very much reduced and probably infertile.

Refs.—TILLAEA AQUATICA L. Sp. Pl. 128 (1753), type European; Jepson, Man. 449 (1925). *T. simplex* Nutt. Jour. Acad. Phila. ser. 1, 1:114 (1817), type loc. Delaware River near Kensington, Philadelphia, *Nuttall. T. angustifolia* Nutt.; T. & G. Fl. 1:558 (1840), type loc. muddy banks of the Oregon and Willamette, *Nuttall. Bulliarda aquatica* DC. Prod. 3:382 (1828). *Tillaeastrum aquaticum* Britt. Bull. N. Y. Bot. Gard. 3:1 (1903). *Crassula aquatica* Schoenl.; Engler & Prantl, Nat. Pflzf. 3^{2a}:37 (1891). *Tillaea angustifolia* var. *bolanderi* Wats.; B. & W. Bot. Cal. 1:209 (1876), type loc. San Francisco, *Bolander. T. drummondii* var. *bolanderi* Jepson, Fl. W. Mid. Cal. 265 (1901). *T. bolanderi* Greene, Fl. Fr. 183 (1891). Var. DRUMMONDII Jepson, Man. 449 (1925). *T. drummondii* T. & G. Fl. 1:558 (1840), type from Texas, *Drummond;* Jepson, Fl. W. Mid. Cal. 265 (1901), ed. 2, 195 (1911). *Tillaeastrum drummondii* Britt. Bull. N. Y. Bot. Gard. 3:1 (1903). *Tillaea peduncularis* Wats.; B. & W. Bot. Cal. 2:446 (1880).

2. **T. erecta** H. & A. Sand Pigmy. Plants diffusely branched and tufted, or sometimes nearly simple, becoming reddish with age, floriferous nearly to the base, 1 to 3 inches high; leaves ovate or oblong, connate at base, 1 to 1½ lines long; sepals ½ line long, equaling or somewhat exceeding the narrowly lanceolate petals; carpels usually 1 (occasionally 2)-seeded.

Dry usually sandy ground of valleys, plains and foothills, 20 to 2500 ft.: common throughout cismontane California. North to Oregon, east to Arizona, south to Lower California. Chile. Mar.-Apr.

Note on the flower.—The petals, at first white, soon develop a linear red spot on the back or become wholly reddish. The carpels are usually 2-ovuled.

Locs.—Redding, *Blankinship;* South Yager Creek, Humboldt Co., *Tracy* 7461; Ocean Beach, Humboldt Co., *Tracy* 3125; Araquipa Hills, nw. Solano Co., *Jepson* 13,437; Montezuma Hills, *Jepson* 13,440; Mt. Tamalpais, *Jepson* 13,438; Berkeley, *Jepson* 13,436; Red Rock, San Francisco Bay, *Jepson* 13,439; San Francisco, *Tracy* 1781; Colma, San Mateo Co., *Jepson* 9106; Stanford, *C. F. Baker* 603; Los Gatos, *Heller* 7340; Santa Cruz, *C. A. Reed;* Pajaro Hills, Monterey Co., *Chandler* 424; Califa, Madera Co., *Jepson* 15,176; Table Mt., Fresno Co., *Jepson* 15,184; Badger road foothills, n. Tulare Co., *H. P. Kelley;* Tipton, Tulare Co., *Jepson* 11,596; Gaviota, Santa Barbara Co., *Eastwood* 44; Santa Anita Wash, Monrovia, *Peirson* 2112; Garvanza, Los Angeles Co., *Geo. B. Grant* 1295; Santa Ana, *Alice King;* La Jolla, *Jepson* 11,846; San Diego, *Jepson* 6675, 6663.

Var. **eremica** Jepson. Plants very slender; pedicels as much as 1½ lines long.—Vallecito, w. Colorado Desert.

Refs.—TILLAEA ERECTA H. & A. Bot. Beech. 24 (1830), type from Chile; Jepson, Man. 449, fig. 442 (1925). *T. minima* Miers; H. & A. in Hook. Bot. Misc. 3:338 (1833); Jepson, Fl. W. Mid. Cal. 265 (1901), ed. 2, 195 (1911). *Crassula minima* Reiche, Fl. Chile 2:369 (1898). *T. minima* var. *subsimplex* Wats.; B. & W. Bot. Cal. 1:208 (1876). *T. leptopetala* Benth. Pl. Hartw. 310 (1849), type loc. San Francisco, *Hartweg.* Var. EREMICA Jepson, Man. 450 (1925), type loc. Vallecito, w. Colorado Desert, *Jepson* 8636.

2. **SEDELLA** Britt. & Rose

Diminutive annuals. Leaves small, ovate to oblong-ovate, very fleshy, resembling rice-grains. Flowers in cymes. Calyx 5-toothed, the teeth triangular. Petals 5, linear to ovate-lanceolate, united at base. Stamens 10. Carpels erect, the ventral margin with a fringe of translucent gland-tipped hair-like processes, the contiguous faces of the carpels also somewhat glandular with short hairs. Seed one, slenderly spindle-shaped.—Species 1. (Diminutive of Sedum).

1. **S. pumila** Britt. & Rose. Stems slender, 1 to 4 inches high, simple or characteristically with a few opposite or subopposite ascending branches of about equal length and hence the plant often flat-topped; leaves few, 2 to 2½ lines long; cyme with 2 or 3 racemose branches; petals yellow, oblong-lanceolate, 1 to 1½ lines long, spreading in anthesis but later becoming erect; sepals minute.

Rocky or gravelly slopes in the foothills, 300 to 3000 feet: Sierra Nevada from Fresno Co. to Tehama Co.; Napa Range. Apr.-June.

Locs.—Dunlap, Fresno Co., *Jepson* 2767; Table Mt., Sonora, *Jepson* 6427; Willow Branch, Marysville Buttes, *Jepson* 13,435; Chico-Oroville road, *Heller* 11,329; Red Bluff (rubble plain ne.), *Jepson* 16,358; betw. Payne Creek and Mineral, Tehama Co., *J. Grinnell;* near Napa, *Jepson* 13,446; near Yountville, *Chandler* 7557; St. Helena, *Jepson* 6234.

Var. **congdonii** Jepson. Styles ¼ line long or slightly more and commonly curved (in the species the styles commonly straight and ½ line long).—Southern Sierra Nevada foothills from Mariposa Co. to Tulare Co. This form differs very slightly from the species and is dubiously given varietal rank. The flowers do not differ in size from the species and apparently do not differ otherwise. The following stations may be noted: Three Rivers (4 mi. e. on Mineral King road), *L. Williams;* Kaweah, Tulare Co., *Hopping* 537; Pinehurst near Millwood, *Newlon* 172; Table Mt., Sparkville, Fresno Co., *Jepson* 15,108; Auberry, Fresno Co., *I. T. Walker.*

Refs.—SEDELLA PUMILA Britt. & Rose, Bull. N. Y. Bot. Gard. 3:45 (1903); Jepson, Man. 450 (1925). *Sedum pumilum* Benth. Pl. Hartw. 310 (1849), type loc. Sacramento Valley, *Hartweg;* Jepson, Fl. W. Mid. Cal. 266 (1901), ed. 2, 196 (1911). Var. CONGDONII Jepson, Man. 450 (1925). *Sedum congdonii* Eastw. Proc. Cal. Acad. ser. 3, 1:135, pl. 11, fig. 5, (1898), type loc. Grant's Sprs., Mariposa Co., *Congdon. Sedella congdonii* Britt. & Rose, l.c.

3. CONGDONIA Jepson

Diminutive herb with very slender tuber-bearing rootstock. Stem simple, scapoid, naked or with 1 or 2 inconspicuous leaves on the upper fourth, bearing a single terminal erect flower. Leaves ovate, relatively thin, closely imbricated in basal rosettes. Petals white, ovate, united for about ⅙ their length into a tube. Carpels erect, several-seeded. Seeds rubescent.—Species 1. (J. W. Congdon of Mariposa Co., acute-minded collector of the Sierran flora.)

1. **C. pinetorum** Jepson. Stem very slender, ½ to 1½ inches high; leaves sessile, 1 to 1½ lines long; petals 1½ to 2 lines long.

East slope of the Sierra Nevada near Mammoth, Mono Co., 8,700 feet.

Refs.—CONGDONIA PINETORUM Jepson, Man. 450 (1925). *Sedum pinetorum* T. Bdg. Univ. Cal. Publ. Bot. 6:358 (1916), type loc. Pine City above Mammoth, *K. Brandegee.*

4. HASSEANTHUS Rose

Stems one to several from globose or oblong corms. Leaves not in rosettes; basal leaves and stem leaves somewhat unlike. Flowers white or greenish, in a cyme, the 2 or 3 branches secund, widely spreading. Petals united at base into a short tube. Carpels widely spreading.—Species 2, California. (Dr. H. E. Hasse, local collector in the Santa Monica Mts., and Greek anthos, flower.)

Basal leaves always with a distinct petiole; petals white, spreading........................1. *H. variegatus.*
Basal leaves linear or semi-cylindric, fleshy, never petioled; petals approximate by edges below to form a false tube, spreading above........................2. *H. elongatus.*

1. **H. variegatus** Rose. Stems 1 to 6 in number, 4 to 9 inches high; corms 1 to 3; basal leaves only 3 to 5 in a season, obovate to oblanceolate, very fleshy, more or less narrowed to a petiole-like base, 4 to 10 lines long, marcescent by the flowering season; stem leaves oblong to lanceolate or linear, sessile, 2 to 5 lines long; cyme 1 to several-flowered, its 2 branches short, much reduced or none; petals white, variegated with red or brownish spots on the midrib, slightly united at base.

Shallow sterile red or yellow clay loam, usually underlaid with hardpan, lower foothills or mesas, 50 to 2000 feet: coast line of Southern California from San Luis Obispo Co. to San Diego Co. May.

Cultural note.—"I have collected specimens of H. variegatus from the following localities: La Jolla; Las Flores, near Oceanside; Pt. San Juan, Orange Co.; Pt. Sal, Santa Barbara Co. These plants, I find, differ from each other only in vigor, all having white flowers (not yellow as usually described). I transplanted some plants of Hasseanthus variegatus from La Jolla to red clay loam in my garden at Los Angeles, gave them plenty of water and a warm location, and they became identical with Hasseanthus blochmanae Rose."—T. W. Minthorn, May 24, 1929.

Locs.—San Diego, *Jepson* 1597; Casmalia beach, n. Santa Barbara Co.; Los Osos Valley, San Luis Obispo Co., *Summers* 291; near Morro, San Luis Obispo Co., *Barber*.

Refs.—HASSEANTHUS VARIEGATUS Rose, Bull. N. Y. Bot. Gard. 3:37 (1903); Jepson, Man. 450 (1925). *Sedum variegatum* Wats. Proc. Am. Acad. 11:137 (1876), type loc. San Diego, *Cleveland*. *Sedum blochmanae* Eastw. Proc. Cal. Acad. ser. 2, 6:422 (1896), type loc. near Casmalia Beach, Santa Barbara Co., *Eastwood & Blochman*. *Hasseanthus blochmanae* Rose, l.c. 37. *H. variegatus* var. *blochmanae* Jepson, Man. 450 (1925).

2. **H. elongatus** Rose. Tuber larger than in no. 1; basal leaves linear or semicylindric, thick and fleshy, more numerous and more persistent than in no. 1; stem leaves similar to those of no. 1, but usually narrower; petals greenish-white to light greenish-yellow, variegated, more united at base than in no. 1, erect below and approximate by their edges to form a false tube, the upper portion spreading.

Sterile red clay loam bluffs or in rocky situations, 100 to 2000 feet: coastal region of Los Angeles Co. and Orange Co. May.

Locs.—Low hills near the south base of the San Gabriel Mts. (Bull. S. Cal. Acad. 17:65); Colegrove, near Hollywood, acc. *T. W. Minthorn;* foothills of the Santa Ana Mts., Orange Co., acc. *T. W. Minthorn;* San Joaquin Hills, Orange Co., *T. W. Minthorn;* Santa Ana Cañon, Orange Co., *Peirson* 3071.

Refs.—HASSEANTHUS ELONGATUS Rose, Bull. N. Y. Bot. Gard. 3: 37 (1903), type loc. San Joaquin Hills, Orange Co., *Abrams* 1785. *H. variegatus* var. *elongatus* Jtn. Bull. S. Cal. Acad. 17: 65 (1918). *H. multicaulis* Rose, l.c. 38, type loc. Santa Monica, Los Angeles Co., *Hasse*.

5. RHODIOLA L.

Perennial herbs. Stems several from a short scaly caudex crowning a stout root. Leaves flat, comparatively thin, distributed equally up the stem, not in rosettes. Flowers dioecious or polygamous, borne in a very dense cyme, the branches not secund. Sepals and petals usually 4 and stamens 8. Petals in ours dark purple, spreading a little. Carpels erect, dark purple.—Species 12, north temperate and arctic zones. (From Greek rhodon, a rose, referring to the rose-scented roots.)

1. **R. rosea** L. var. **integrifolia** Jepson. WESTERN ROSEROOT. Stems erect, 3 to 6 inches high; leaves ovate to oblong-ovate, entire or obscurely dentate, sessile by a broad base, 5 to 12 lines long, 2½ to 4 lines wide, green; flowers 1½ to 2½ lines long.

Alpine, 9500 to 12,500 feet: Sierra Nevada from Tulare Co. to Eldorado Co. North to Alaska, east to the Rocky Mts. June-July.

Tax. note.—The chief difference between the European Rhodiola rosea L. and the west American form of it resides in the pistillate flowers. The pistillate flower in western plants is very fleshy and has larger and thicker calyx-lobes than in case of the European plant.

Locs.—Mt. Whitney, *K. D. Jones;* Harrison Pass, *Jepson* 5030; Mt. Silliman, Tulare Co., *K. Brandegee;* Kearsarge Pinnacles, *Jepson* 849; Colby Mdw. to Muir Pass, *E. Ferguson* 494; Kaiser Peak, Fresno Co., *A. L. Grant* 1448; Vogelsang Pass, *Jepson* 3219; Mt. Lyell, *Jepson* 3337; Mt. Dana, *Jepson* 3300; Grass Lake, Fallen Leaf, *Ottley* 805; Angora Lake, near Lake Tahoe, *M. S. Baker*.

Refs.—RHODIOLA ROSEA L. Sp. Pl. 1035 (1753), type European. Var. INTEGRIFOLIA Jepson, Man. 450 (1925). *Rhodiola integrifolia* Raf. Atl. Jour. 1:146 (1832), type loc. Rocky Mts. *Sedum rhodiola* B. & W. Bot. Cal. 1:209 (1876).

6. SEDUM L. Stone-crop

Ours perennial herbs. Flowers usually yellow but often white or reddish-tinged, disposed in a cyme composed of about 2 or 3 racemose secund branches. Petals 5, distinct or a little united at the base. Stamens 10. Carpels distinct or nearly so, several-seeded.—Species about 150, all continents save Australia but mostly north temperate zone. (Latin sedeo, to sit, on account of the lowly habit.)

Carpels widely divergent, their outer (and finally lower) edges almost horizontal or at right angles with the pedicel; leaves becoming scarious upon drying; rootstocks horizontal, usually branched, giving rise to two kinds of erect or ascending shoots: (a) flowering stems (leafy below), and (b) short densely leafy branches which are deciduous and propagating.
  Leaves oblong to oblong-ovate, 3 to 6 lines long, broadest a little below the middle; Coast Ranges and s. Sierra Nevada........1. *S. radiatum.*
  Leaves linear-lanceolate, 5 to 11 lines long, broadest at the base; Lassen and Modoc Cos....... 2. *S. douglasii.*
Carpels erect or suberect; leaves not becoming scarious upon drying (or slightly so at the base in no. 3); plants commonly spreading by well-developed horizontal rootstocks; rootstocks branching, the branches commonly ending in dense leaf-rosettes and so forming mat-like plants.
  Leaves terete, green; leaf rosettes ovate........3. *S. stenopetalum.*
  Leaves plane.
    Leaves mostly elliptic, not in rosettes; petals white; anthers purple........4. *S. niveum.*
    Leaves spatulate, in rosettes; anthers white.
      Rosettes with the apices of the leaves somewhat divergent and free; root-crown producing (from beneath rosette) 1 or few horizontal rootstocks each tipped by a rosette.
        Petals distinct or nearly so, yellow or white; cyme mostly flat-topped........ 5. *S. spathulifolium.*
        Petals united ⅙ to ¼ their length, white (or yellow and usually white-margined); cyme mostly elongated or thyrsoid........6. *S. obtusatum.*
      Rosettes with the leaves very closely imbricated, the apices of the leaves with only the upper side exposed; root-crown producing (from beneath rosette or lowest leaf axils) several radiating runners each ending in a rosette....7. *S. purdyi.*

1. **S. radiatum** Wats. Cañon Sedum. (Fig. 145.) Flowering stems 3 to 7 inches high; sterile branchlets densely imbricated with leaves; leaves thin, flattened, oblong to oblong-ovate, 3 to 6 lines long and 1 to 1½ lines wide, a little wider than the broad sub-clasping base, white-membranous and 4 to 7-nerved on drying; petals oblong-acute, bright yellow, widely spreading, 3 to 4 lines long; dehisced follicles with the inside of the tips shining white in extreme age.

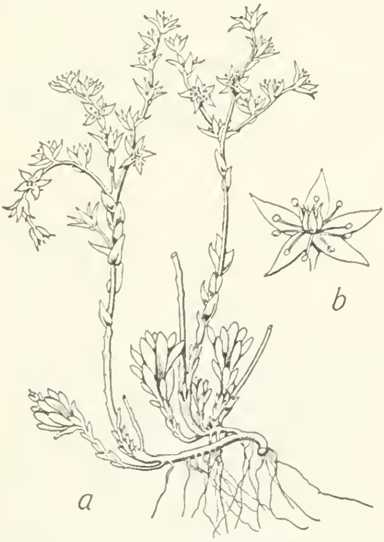

Fig. 145. Sedum radiatum Wats. *a*, habit, × ½; *b*, fl., × 1½.

Rocky cañon walls or stony banks, 1500 to 4500 feet: Coast Ranges from Humboldt Co. to Monterey Co.; s. Sierra Nevada (Tulare Co.). June-July. It differs from S. douglasii Hook. in its range and in the size and shape of its leaves, but is manifestly a close relative of it.

Locs.—South Yager Creek, Humboldt Co., *Tracy* 7726; Kinitz, upper Van Duzen River, Humboldt Co., *C. M. Wilder;* Mail Ridge, s. Humboldt Co., *Jepson* 1890; Round Valley, Mendocino Co., *Westerman;* Idol House, n. Mendocino Co., *Jepson* 1871; Elk Ridge, Mendocino Co., *Bolander* 6565; Pope Valley grade, Napa Co., *K. Brandegee;* Lagunitas Creek, Marin Co., *T. Brandegee;* Slick Rock, Giant Forest road, *W. Fry* 416; Cedar Creek, Sequoia Park, *Jepson* 610.

Refs.—Sedum radiatum Wats. Proc. Am. Acad. 18:193 (1883), type loc. Gabilan Peak, Monterey Co., *Brewer* 742; Jepson, Fl. W. Mid. Cal. 265 (1901), ed. 2, 195 (1911), Man. 451 (1925).

2. **S. douglasii** Hook. Columbia Sedum. Stems 3 to 8 inches high; leaves linear-lanceolate, more or less flattened, 5 to 11 lines long, ½ to 1 line wide, the much dilated base scarious-sheathing; inflorescence racemose, sparsely branched, 1½ to 4 inches long; petals as in no. 1.

Rocky places, 4500 to 5500 feet: Lassen and Modoc Cos. North to British Columbia and Idaho. July-Aug.

Locs.—Dixey Valley, Lassen Co., *Nutting;* Parker Creek, Modoc Co., *Taylor & Bryant;* Lake City, Modoc Co., *C. C. Bruce* 2325; Goose Lake, hills east, *R. M. Austin.*

Refs.—Sedum douglasii Hook. Fl. Bor. Am. 1:228 (1834), type loc. Columbia River valley, *Douglas;* Jepson, Man. 451 (1925).

3. **S. stenopetalum** Pursh. Explorers Sedum. Flowering stems erect, 3 to 7½ inches high; leaves terete, green, 2 to 4 lines long, in close ovate clusters; cymes rather close, sparsely branched; petals bright yellow, or at times with a dark midvein, spreading, 3 to 4 lines long.

Montane slopes, high easterly localities in the Sierra Nevada or mainly north and east of its crest, 7000 to 10,000 feet: eastern Fresno Co.; Modoc and Siskiyou Cos. North to Alberta, east to the Rocky Mts. July.

Locs.—Mono Hot Sprs., Fresno Co., *E. Ferguson* 426; Mt. Bidwell, *Jepson* 7898; Twelvemile Creek, Modoc Co., *Manning;* Mt. Eddy, *Alexander & Kellogg* 323; Marble Mt., *Jepson* 2838. Wyo.: Upper Basin, Yellowstone Park, *Jepson* 2525.

Refs.—Sedum stenopetalum Pursh, Fl. 324 (1814), type from Clark's River and Kooskooskie, *Lewis;* Jepson, Man. 451 (1925).

4. **S. niveum** Dav. Ledge Sedum. Stems ascending or erect from a fistulous creeping rootstock, 2 to 3¼ inches high; leaves elliptic or elliptic-obovate, mostly rather crowded, 2 to 4 lines long; cymes rather small; petals lanceolate to ovate-lanceolate, white, the upper half of the midnerve pinkish, 2½ to 3½ lines long.

Rocky slopes or ledges, 8000 to 9300 feet: San Bernardino Mts. July-Aug.

Locs.—Lost Creek, *Peirson* 4951; Dollar Lake, *Peirson* 3293; creek east of Foxesee, *Peirson* 2298.

Ref.—Sedum niveum Dav. Bull. S. Cal. Acad. 20:53 (1921), type loc. Sugar Loaf (n. slope), San Bernardino Mts., *R. Kessler* 3430.

5. **S. spathulifolium** Hook. Moss Sedum. Flowering stems erect, 4 to 8 inches high; leaves of the rosettes broadly spatulate, glaucous or occasionally green, 5 to 10 lines long, 2½ to 3½ lines wide, the apex rounded, with a small acumination; stem leaves smaller and oblongish; cyme dichotomously branched, 1 to 2 inches wide, somewhat less high; petals lanceolate, acuminate, widely spreading, yellow or white, 3 to 4 lines long.

Usually gregarious on shaded moss-covered rocks in the foothills, 200 to 5000 feet: San Gabriel and San Bernardino mountains; Coast Ranges from the Santa Cruz Mts. to Siskiyou Co.; Sierra Nevada from Tulare Co. north. North to British Columbia. May-June. It is in California the most widely distributed Crassulaceous species after Tillaea erecta.

Locs.—S. Cal.: Mill Creek Cañon, San Bernardino Mts., *Jepson* 5573; West Fork Eaton Cañon, *Peirson* 428; West Fork San Gabriel River, *Peirson* 2472. Coast Ranges: Mt. Umunhum, Santa Cruz Mts., *H. E. Parks;* Stanford, *C. F. Baker* 3198; Mt. Davidson, San Francisco, *Jepson* 10,598; Mt. Diablo, *Jepson* 7610; Berkeley Hills, *Jepson;* Mt. Tamalpais, *Chesnut;* Fairfax, *Newlon;* Sonoma Cañon, Kenwood, *Jepson* 10,017; White Sulphur Sprs., St. Helena, *Chandler* 7558; Cache Creek Cañon, Yolo Co., *C. F. Baker* 3236; Hubbard sta., near main Eel River, *Jepson* 1908; Orrick, *Peirson* 3957; Shasta Sprs., Siskiyou Co., *Rosenbaum.* Sierra Nevada: Vernal Fall, Yosemite, *Jepson* 13,431; Italian Bar, Tuolumne Co., *Jepson* 6367; Bear Valley, Nevada Co., *Jepson* 13,432.

Refs.—Sedum spathulifolium Hook. Fl. Bor. Am. 1:227 (1834), type loc. along the Columbia River, *Douglas;* Jepson, Fl. W. Mid. Cal. 265 (1901), ed. 2, 185 (1911), Man. 451 (1925). *S. yosemitense* Britt. Bull. N. Y. Bot. Gard. 3:44 (1903), type loc. between Vernal and Nevada Falls, Yosemite, *Hall & Babcock.* *S. pruinosum* Britt. N. Am. Fl. 22:72 (1905), type loc. Crescent City, *Eastwood.* *S. californicum* Britt. Bull. N. Y. Bot. Gard. 3:44 (1903), type loc. Mt. Shasta, *Brown.* *S. anomalum* Britt. N. Am. Fl. 22:72 (1905). *Gormania anomala* Britt. Bull. N. Y. Bot. Gard. 3:30 (1903), type loc. San Luis Obispo Co., *Summers.*

6. **S. obtusatum** Gray. Granite Sedum. Flowering stems erect, leafy, 3 to 6 inches high; leaves of the rosettes broadly spatulate, thick, green, 5 to 12 lines long, 2 to 3 lines wide; stem leaves linear-spatulate to orbicular; cyme elongate or thyrsoid, sometimes flat-topped; petals white (or brownish-yellow and usually with a well defined white margin), oblong-lanceolate, 3 to 5 lines long, the upper portion spreading or recurving, united for 1/6 to 1/4 of their length into a distinct tube.

On rocks or granite detritus in the mountains, 4500 to 12,000 feet: Sierra Nevada from Tulare Co. to Nevada Co.; Coast Ranges from Lake and Mendocino Cos. to Siskiyou and Del Norte Cos. June-July. Very close to S. oreganum Nutt. of Oregon and perhaps not specifically distinct.

Locs.—Sierra Nevada: Alta Mdws., Tulare Co., *Hopping* 524; Mt. Silliman, *Hopping* 361; Piute Creek, Fresno Co., *E. Ferguson* 458; Lake Merced, Merced River, *Jepson* 3182; Eagle Peak trail to El Capitan, *Jepson* 4356; Shadow Lake, Tuolumne Co., *A. L. Grant* 1572; Soda Sprs. cañon, Kennedy Lake, *A. L. Grant* 550; Echo Ridge near Fallen Leaf, *Ottley* 1177; Bear Valley, Nevada Co., *Jepson* 13,445; Summit sta., Nevada Co., *Jepson* 13,444. North Coast Ranges: Snow Mt., Lake Co.; Middle Eel River near Castle Peak, *Jepson* 13,443; Horse Mt., Humboldt Co., *Tracy* 7647; Klamath River, n. Humboldt Co., *Chandler* 1439; Twin Lakes to Thompson Peak, Trinity Co., *Alexander & Kellogg* 297; Mt. Eddy, *Copeland* 3781; Forest House Mountain, Siskiyou Co., *Butler* 140; Kelsey Trail, Preston Peak, w. Siskiyou Co., *Jepson* 2867; South Fork Smith River, Del Norte Co., *Jepson* 2907.

Refs.—Sedum obtusatum Gray, Proc. Am. Acad. 7:342 (1868), type loc. Mt. Hoffman, *Brewer;* Jepson, Man. 451 (1925). *Echeveria obtusata* Nels. & Mcbr. Bot. Gaz. 56:476 (1913). *Gormania obtusata* Britt. Bull. N. Y. Bot. Gard. 3:29 (1903). *Gormania hallii* Britt. l.c., type loc. Tuolumne Mdws., *Hall & Babcock* 3545. *S. obtusatum* var. *hallii* Smiley, Univ. Cal. Publ. Bot. 9:213 (1921). *Gormania burnhami* Britt. l.c. 30, type loc. betw. Lake Eleanor and Lake Vernon, Tuolumne Co., *Burnham.* *G. retusa* Rose, Bull. N. Y. Bot. Gard. 3:31 (1903), type loc. Mt. Sanhedrin, Lake Co., *Heller.* *G. eastwoodiae* Britt. l.c. 31, type loc. Red Mt., n. Mendocino Co., *Eastwood.* *S. rubroglaucum* Praeger, Jour. Bot. 57:51 (1919), type loc. Short Trail, Yosemite Valley, *Hall.* *Echeveria brittonii* Nels. & Mcbr. Bot. Gaz. 56: 476 (1913), based on Gormania hallii Britt.

7. **S. purdyi** Jepson sp. n. Ray Sedum. Flowering stem 3 to 4 inches high, arising from a basal rosette, below which are produced several naked horizontal runners (1 to 2 inches long) which terminate in compact flat rosettes; leaves of the rosettes orbicular or orbicular-spatulate, 1 to 9 lines long; leaves of the erect stems elliptic, obtuse, recurved or sometimes ascending; cyme rather densely flowered and compact; petals white, oblong-lanceolate, 2 lines long, the opposite stamens inserted just above the base.—(Caudex folia rosulata, caules unc. 3–4 altos et flagella horizontalia (unc. 1-2 longa) emittens; folia rosulata orbiculata vel orbiculato-spatulata, unc. 1–9 longa; folia caulina elliptica, obtusa, recurvata vel aliquando ascendentia; cyma aliquantum compacta; petala alba, oblongo-lanceolata, lin. 2 longa, staminibus oppositis paulo supra basim insertis.)

Rocky slopes, 1000 to 4000 feet: Marble Mt. region to northern Shasta Co. Apr.

Locs.—Etna Mills, first comm. by *Carl Purdy* (type); Kennett, Shasta Co., *Blankinship.*

7. ECHEVERIA DC. Live-for-ever

Perennial herbs. Flowering stems with reduced or scale-like leaves, one or few from the leaf axils of a conspicuous basal rosette. Leaves of the rosette thick and fleshy. Flowers disposed in cymes, their secund branches racemose or thyrsoid. Petals white, yellow, orange or reddish, in ours united at base or nearly distinct. Stamens 10, borne on the tube or base of the petals. Carpels many-seeded.—Species about 180, North and South America. (D. Atanasio Echeverria, botanical artist of Mexico, who made 500 colored drawings for Mocino and Sesse, c. 1790–1804.)

Generic and specific criteria.—Both Bentham and Hooker (Genera Plantarum 1:659) and Schönland in Engler and Prantl's Die Natürlichen Pflanzenfamilien (3^{2a}:34) included the American species of DeCandolle's Echeveria in the genus Cotyledon. In a later treatment by Berger, Cotyledon is restricted essentially to Africa (Pflanzenfamilien, ed. 2, 18a:471,—1930). Technical grounds for the separation of the American Echeverias are largely insufficient. The sum total of characters, however, helps to establish a sort of cleavage between the New World and Old World forms. In Echeveria the leaves are alternate (rarely opposite) and usually produce rosettes. In Cotyledon the leaves are opposite or alternate, rarely producing rosettes. In Echeveria the calyx is usually as long as the corolla-tube and commonly exceeds it. In Cotyledon the calyx is usually much shorter than the corolla-tube. In Echeveria the petals are united usually only at the very base or less than half way and are often ridged or angled. In Cotyledon the petals are usually united half way or more, the tube being terete or 5-angled. The most constant character seems to reside in the inflorescence: Echeveria has an inflorescence arising laterally, while Cotyledon has an inflorescence arising terminally. Segregation of Echeveria from Cotyledon for geographic reasons is not necessarily a point of moment. Those botanists who accept minor generic segregates hold, for example, that true Sphaeralceas and true Malvastrums grow both in the Mexico-California region and in South Africa.

The Californian representation of Echeveria has been set off by Britton and Rose under the genus name Dudleya. Echeveria with its "strongly 5-angled flowers" is contrasted with Dudleya's "tubular" flowers, but this distinction does not hold. Several Dudleyas, such as Echeveria lanceolata and caespitosa, have strongly 5-angled flowers due to the markedly keeled petals. It is implied by Britton and Rose that the petals in Dudleya are united more or less to the middle, which is contrary to the facts. The petals in our Californian species are united only at base and are often nearly distinct. For Echeveria Britton and Rose assign as a stamen character that 5 (of the 10) stamens are attached near the middle of the petals, but they describe the stamens in E. australis as attached one-fourth the distance above the base. In garden plants we find various Echeverias in which the antipetalous stamens are inserted near the base of the nearly distinct petals, just as in the native Californian species. The Californian forms as to geographical origin must be thought of as derived from Mexico and we think the two groups quite congeneric. Species defined as of the genus Dudleya by Britton & Rose are not limited to California and Lower California, but are also found in Arizona, which belongs to the same floristic region as northern Mexico.

For the two Californias Britton and Rose have published a considerable number of new species under their generic name Dudleya. Major divisions in their grouping (N. Am. Fl. 22:33) are distinguished by such paired headings as "Calyx-segments lanceolate to triangular-lanceolate" and "Calyx-segments ovate, ovate-lanceolate or triangular-ovate." But such characters depend, in certain of our forms at least, on degree of development of the organ concerned; a single individual may exhibit both ovate and lanceolate calyx-segments according to the age of the flowers. These authors, too, make a good deal of inflorescence, but the inflorescence is very inconstant in most of our species and lacks distinctive characters. In one small colony a species often shows pronounced differences. Consider Echeveria lanceolata Nutt. At a station on Palomar Mt. we studied two plants (*Jepson* 1530) growing side by side, wholly identic save that the first had simple elongated divisions to the cyme, the second had the divisions branched. Other characters used by these authors relate to inconsiderable or wavering features, so that we, in this work, dispose of their proposed species with difficulty, a situation not lessened by the fact that so many of them are represented by only a single station, often by only a single collection. In order to provide satisfactory groundwork for classification, a study of garden cultures in reference to variation in the field, carried on more extensively than hitherto, would seem necessary. Such garden cultures to be useful must, however, bring together plants selected as the result of a planned geographic survey, and not mere casual or incidental gatherings. In such a group as this where differentiating or well-marked vegetative and floral characters are largely absent, the use of such characters as are so commonly employed in many other groups does not answer. It seems to us desirable that effort be directed towards the special biology of the species, with a view of accumulating ample knowledge of the life history and distribution.

Carpels erect, usually distinct; corolla cylindric or obconic.

Rosettes very large (6 to 8 inches wide), raised on a stout caudex 2 to 6 inches high; plant densely white-mealy; leaves 2 to 2½ inches wide; seaward belt, S. Cal.................... 1. *E. pulverulenta.*

Rosettes medium-sized (½ to 3 inches wide), white-glaucous to green, borne at the ground on a short caudex; leaves ¼ to 1½ inches wide.

Pedicels stout, shorter than the flowers; flowers yellow.

Rosettes globose, very compact; leaves very thick, often slightly ridged towards base on upper side; sea bluffs or headlands.......................2. *E. cotyledon.*

Rosettes somewhat flat-topped, less dense; leaves less thick, often slightly cupped towards base on upper side; seaward belt, San Francisco to San Luis Obispo..3. *E. caespitosa.*

Pedicels slender, usually equaling or exceeding the flowers.

Cyme mostly branched and rebranched, thus rounded or thyrsoid; mostly central Cal.........................4. *E. laxa.*
Cyme mostly divided into a few racemose branches, these often elongated and simple, sometimes rebranched, sometimes short; mostly Southern Cal.........5. *E. lanceolata.*
Carpels widely spreading, slightly united at base; corolla somewhat rotately spreading.
Leaves lanceolate, distinctly flattened; inflorescence cymose or thyrsoid................6. *E. viscida.*
Leaves linear, terete or subterete, flattened strongly only near the base.
Inflorescence mostly open, commonly a thyrsoid cyme..........................7. *E. edulis.*
Inflorescence a round-topped cyme, densely flowered..........................8. *E. densiflora.*

1. **E. pulverulenta** Nutt. CHALK LETTUCE. Plants 2½ to 4 feet high, covered with a dense white-mealy powder; flowering stems very stout, densely leafy; rosettes rather loose and flattish, their leaves broadly spatulate or oblong, rounded at apex but abruptly short-acute, spreading, 3 to 7 inches long, 2 to 2½ inches wide; stem leaves ovate or suborbicular, sessile or clasping, ¾ to 1½ inches wide; branches of the cyme 2 or 3, mostly simple, widely spreading, ½ to 1½ feet long; petals red, narrow, 6 to 8 lines long; pedicels 1 to 3 lines long.

Dry rocky slopes, 20 to 2000 feet: coastal Southern California from Los Angeles Co. to San Diego Co. South to Lower California. May-June.

Habit note.—Due to their large size and chalky-white color, the plants of this species are a striking feature of sea-bluffs and of the rocky hillsides of cañons in the coastal belt of Southern California. It is sometimes said by collectors that exceptionally large rosettes "nearly fill the mouth of a bushel basket."

Locs.—Santa Monica Mts., acc. *J. Ewan;* Claymine Cañon, Santa Ana Mts., *J. T. Howell* 2840; Augustine Ranch, Palomar Mt., *Jepson* 1550; Del Mar, *Jepson* 1620; San Diego, *Mary Spencer* 164.

Refs.—ECHEVERIA PULVERULENTA Nutt.; T. & G. Fl. 1:560 (1840), type loc. San Diego, *Nuttall. Cotyledon pulverulenta* Baker; Saunders, Ref. Bot. 1: t. 66 (1869); B. & W. Bot. Cal. 1:211 (1876); Jepson, Man. 452 (1925). *Dudleya pulverulenta* Britt. & Rose, Bull. N. Y. Bot. Gard. 3:13 (1903). *Echeveria argentea* Lem. Ill. Hort. 10: misc. 78 (1863).

2. **E. cotyledon** Nels. & Mcbr. BLUFF LETTUCE. Plants glabrous, glaucous, 5 to 12 inches (or to 2⅓ feet) high; rosettes dense, subglobose; leaves linear or oblong, rather thick for their width, 1 to 2 inches long, ½ to ¼ as wide, usually widest at the base; flowering stems stout, their leaves many, broad, somewhat clasping, 5 to 6 lines wide; cyme usually very compact; flowers on very short stout pedicels (mostly ½ to 1 line long); corolla cylindric, not angled or only slightly, cream-white.

Bluffs along the ocean: Monterey Co. to Del Norte Co. June-Aug.

Habit note.—After initial branching the caudex or root-crown continues to grow several to many years by the terminal bud only. The crowded leaves persist several years and in consequence there result in time leafy but very compact cylindric bodies 3 to 5 inches or more long, which are (in the extreme form) rather markedly different from those of the allied species, C. caespitosa and C. laxa.

Locs.—Malpaso Creek, Monterey coast, *Jepson* 2613; Pt. Joe, *Jepson* 9741; Pacific Grove, *Jepson* 13,430; Bakers Beach, San Francisco, *H. A. Walker* 1794; Tiburon, *Jepson* 12,922; Point Reyes, *Elmer* 5011; Ft. Bragg, *Jepson* 13,429; Cape Mendocino, *Jepson* 2144; Ragged Hill, s. of Crescent City, *Jepson* 9407.

Refs.—ECHEVERIA COTYLEDON Nels. & Mcbr. Bot. Gaz. 56:477 (1913). *Sedum cotyledon* Jacq. Eclog. 1:27, pl. 17 (1811), type loc. Monterey. *Dudleya cotyledon* Britt. & Rose, Bull. N. Y. Bot. Gard. 3:28 (1903). *Echeveria farinosa* Lindl. Jour. Hort. Soc. Lond. 4:292 (1849), type loc. rocks near Carmel Bay, *Hartweg. Cotyledon farinosa* Baker; Saunders, Ref. Bot. 1:t. 71 (1869); Jepson, Fl. W. Mid. Cal. 266 (1901), ed. 2, 196 (1911), Man. 452, fig. 443 (1925). *Dudleya farinosa* Britt. & Rose, Bull. N. Y. Bot. Gard. 3:15 (1903). *Cotyledon californica* Baker, l.c. 1:t. 70 (1869), type from Cal. *Echeveria californica* Baker, l.c. (?)*Dudleya compacta* Rose, Bull. N. Y. Bot. Gard. 3:25 (1903), type from "San Francisco Bay", *Eastwood. D. eastwoodiae* Rose, l.c. 25, type loc. Bodega Point, Sonoma Co., *Eastwood. D. septentrionalis* Rose, l.c. 26, type loc. Crescent City, *Eastwood.*

3. **E. caespitosa** DC. COAST LETTUCE. Plants green or somewhat glaucous, ⅓ to 1¾ feet high; rosettes usually rather loose; leaves 2 to 3 (even 6) inches

long, 6 to 11 lines wide, above the middle a trifle wider than at the base, not so conspicuously thick as in no. 2; cyme with close or elongated branches; pedicels stout; petals yellow or pale.

Rocky ground near the coast, 1 to 100 feet: Santa Barbara Co. to San Francisco. May-July.

Locs.—Pelican Bay, Santa Cruz Isl., *Jepson* 12,113; San Luis Obispo Co., *Alice King;* Pismo Beach, Cypress Pt., Carmel Bay, *Jepson* 9739; Marina sta., Monterey Co., *Jepson* 9780; Gazos Creek, Pescadero, *Jepson* 4164; Pilarcitos, San Mateo Co., *C. F. Baker* 3440; San Bruno Hills, San Mateo Co., *Nutting.*

Tax. note.—The nativity of Echeveria caespitosa DC. is here considered as Californian for the following reasons. This name rests on Cotyledon caespitosa Haw., the original of which is cited as from the Cape of Good Hope, but erroneously. In Aiton's Hortus Kewensis, ed. 2, 3:109 (1811), Robert Brown describes Cotyledon linguiformis as "Nat. of California. Archibald Menzies, Esq.". De Candolle, knowing that Haworth's and Brown's plants were the same, cites their two names under the combination Echeveria caespitosa (cf. Prod. 3:401,—1828) and indicates the species as of California. As to Brown's authorship see Journal of Botany, 50: supplem. 3,—1912.

Refs.—ECHEVERIA CAESPITOSA DC. Prod. 3: 401 (1828). *Cotyledon caespitosa* Haw. Misc. Nat. 180 (1803), the original cited as from Cape of Good Hope, but erroneously, in reality from California; Jepson, Fl. W. Mid. Cal. 267 (1901), ed. 2, 196 (1911), Man. 452, fig. 444 (1925). *Dudleya caespitosa* Britt. & Rose, Bull. N. Y., Bot. Gard. 3:27 (1903). *Cotyledon reflexa* Willd. Enum. Hort. Berol. Supp. 24 (1813). *C. palmeri* Wats. Proc. Am. Acad. 14:292 (1879), type loc. San Simeon Bay, San Luis Obispo Co., *Palmer. Dudleya palmeri* Britt & Rose, Bull. N. Y. Bot. Gard. 3:24 (1907). *E. palmeri* Nels. & Mcbr. Bot. Gaz. 56:476 (1913), not Rose (1903). *Cotyledon lingula* Wats. l.c. 293, type loc. San Simeon Bay, *Palmer. Dudleya lingula* Britt. & Rose, l.c. 26. *E. lingula* Nels. & Mcbr. l.c. *Dudleya helleri* Rose, Bull. N. Y. Bot. Gard. 3:27 (1903), type loc. e. side Monterey Bay, *Heller.* (?)*D. greenei* Rose, l.c. 17, type loc. Santa Cruz Isl., *Greene.* (?) *D. candelabrum* Rose, l.c., type loc. Santa Cruz Isl., *Greene.*

4. **E. laxa** Lindl. ROCK LETTUCE. (Fig. 146.) Plants 7 to 12 inches high, green or glaucous; rosettes loose; leaves oblong to lanceolate, evidently wider above than at base, 1 to 3 inches long, ½ to 1 inch wide, relatively thinnish; cyme dichotomous, rather loose; pedicels slender, some of them equaling or exceeding the flowers; petals clear yellow or orange, but frequently turning reddish on drying.

Rocky ground, 300 to 5500 feet: immediately back of the coast line in middle California and east across the Coast Ranges; south to San Benito Co.; north to Mendocino Co. May-June. It is, with the var. nevadensis, the common and in most parts of its range, the only species of the genus over the interior and mountainous part of middle California.

Note on variation.—This species in recent years has been subject to much segregation on the basis of features that belong more or less to individual plants. The binomials that we cite below as synonyms seem referable here as judged by our knowledge of living plants of the Californian representation at large, both in the field and in the garden. The published diagnoses of all of them tend to persuade us that the individual plants, as represented by the sheets of specimens on which these new names rest, lie on one plane and are apparently not susceptible of satisfactory definition even as forms if the diagnoses are to be applied, as they must be if accepted, to material from a field having a range wider than the exact station cited as the type of a segregate.

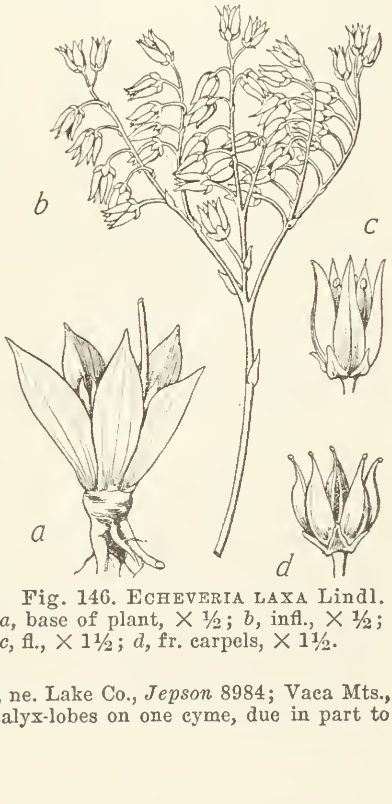

Fig. 146. ECHEVERIA LAXA Lindl. *a*, base of plant, × ½; *b*, infl., × ½; *c*, fl., × 1½; *d*, fr. carpels, × 1½.

Locs.—Yollo Bolly Mts., *C. F. Baker* 3235; Stanton, ne. Lake Co., *Jepson* 8984; Vaca Mts., *Jepson* 13,416 (this one plant shows several shapes of calyx-lobes on one cyme, due in part to differences in age); Pellejo Hills, w. Solano Co., *Jepson* 13,417; Pope Creek, Napa Co., *Jepson* 10,418a; White Sulphur Sprs., St. Helena, *Chandler* 7570; Sonoma Cañon, Kenwood, *Jepson* 10,016; North Peak, Mt. Diablo, *Jepson* 7604; Mill Valley, *H. A. Walker* 1375; Lexington, s. of Los Gatos, *Pendleton* 737; Mt. Umunhum, *Parks;* upper San Benito River near Lorenzo Creek, *Jepson* 12,228; Lime Kiln Creek, Santa Lucia Mts., *Jepson* 1676 (whole plant a lively red, or others in the colony with very little red color).

Var. **paniculata** Jepson Comb. n. Cyme paniculate (the main axis with a terminal and several lateral peduncled cymes).—Mt. Hamilton Range.

Var. **setchellii** Jepson comb. n. Stem branched from above the middle, the branches racemose, elongated.—Foothills, Santa Clara Valley.

Var. **cymosa** Jepson comb. n. Plants 10 to 14 inches high; leaves oblong-lanceolate, 4 to 4½ inches long.—Napa Valley (St. Helena, *Jepson* 13,420).

Var. **nevadensis** Jepson comb. n. Plants small (3 to 4½ inches high), with small cymes; leaves often very broad.—Montane, 2250 to 4500 feet: Sierra Nevada, at lower altitudes and in the foothills.

Locs.—Newcastle, *Mackie;* Folsom, *Alice King;* Gwin Mine, Calaveras Co., *Jepson* 1810; Italian Bar, Tuolumne Co., *Jepson* 6380; Cold Spr., Tuolumne Co., *Jepson* 6463; Hetch-Hetchy, *Jepson* 4621; Yosemite, *Drew;* Mariposa, *Congdon;* Middle Fork Kings River, *Henrietta Eliot.*

Var. **minor** Jepson comb. n. Plants small, 2 to 5 inches high; leaves short and broad, disposed to be rhomboidal, abruptly acute or slenderly acuminate, ½ to 1½ inches long; cyme small, the flowers relatively few, mostly discrete; flowers brilliant red or brownish-yellow.—Mountain ridges and cañons, 1000 to 8500 feet: San Gabriel Mts.; San Bernardino Mts.

Locs.—Eaton Cañon, *Peirson* 452; Mt. Gleason, *Peirson* 453; Ontario Ridge, *Peirson* 262; San Bernardino foothills, *Parish.*

Refs.—ECHEVERIA LAXA Lindl. Jour. Hort. Soc. Lond. 4:292 (1849), type loc. woods near Monterey, *Hartweg. Cotyledon laxa* B. & W. Bot. Cal. 1:212 (1876), Jepson, Fl. W. Mid. Cal. 267 (1901), ed. 2, 197 (1911), Man. 453 (1925). *Dudleya laxa* Britt. & Rose, Bull. N. Y. Bot. Gard. 3:18 (1903). *Cotyledon plattiana* Jepson, Fl. W. Mid. Cal. 267 (1901), type loc. Vaca Mts., *E. H. Platt;* ed. 2, 197 (1911). *Dudleya plattiana* Britt. & Rose, Bull. N. Y. Bot. Gard. 22:40 (1903). *E. plattiana* Nels. & Mcbr. Bot. Gaz. 56:477 (1913). *Dudleya sheldonii* Rose, l.c. 3:20, type loc. n. base Mt. Tamalpais, *Eastwood. E. purpusii* Schumann, Gartenfl. 45:608 (1896), type from Cal., *Purpus. Dudleya purpusii* Britt. & Rose, Bull. N. Y. Bot. Gard. 3:20 (1903), mts. of middle Cal., *Purpus. D. goldmanii* Rose, Bull. N. Y. Bot. Gard. 3:19 (1903), type loc. Pine Valley, head of Carmel River, Monterey Co., *E. A. Goldman* 763. *D. humilis* Rose, l.c. 3:27, type loc. Mt. Diablo summit, *Eastwood* (a dwarf form). Var. PANICULATA Jepson. *Cotyledon laxa* var. *paniculata* Jepson, Man. 453 (1925). *Cotyledon caespitosa* var. *paniculata* Jepson, Fl. W. Mid. Cal. 267 (1901), type loc. Morrison Cañon, Mt. Hamilton Range, *Jepson* 13,419. *Dudleya paniculata* Britt. & Rose, Bull. N. Y. Bot. Gard. 3:27 (1903). *E. jepsonii* Nels. & Mcbr. Bot. Gaz. 56: 477 (1913). Var. SETCHELLII Jepson. *Cotyledon laxa* var. *setchellii* Jepson, Fl. W. Mid. Cal. 267 (1901), type loc. Tulare Hill near Coyote sta., Santa Clara Valley, *Jepson* 13,418; Man. 453 (1925). *C. setchellii* Jepson, l.c. ed. 2, 197 (1911). *Dudleya setchellii* Britt. & Rose, Bull. N. Y. Bot. Gard. 3:15 (1903). *E. setchellii* Nels. & Mcbr. Bot. Gaz. 56: 477 (1913). Var. CYMOSA Jepson. *Cotyledon laxa* var. *cymosa* Jepson, Man. 453 (1925). *C. cymosa* Baker; Saund. Ref. Bot. 1:t. 68 (1869), type from Cal. Var. NEVADENSIS Jepson. *Cotyledon laxa* var. *nevadensis* Jepson, Man. 453 (1925). *Cotyledon nevadensis* Wats.; B. & W. Bot. Cal. 1:212 (1876), type loc. Sonora, *Bigelow. Dudleya nevadensis* Britt. & Rose, Bull. N. Y. Bot. Gard. 3:20 (1903). *E. nevadensis* Nels. & Mcbr. Bot. Gaz. 56:477 (1913). *Dudleya gigantea* Rose, Bull. N. Y. Bot. Gard. 3:23 (1903), type loc. New York Falls, Amador Co., *Hansen.* Var. MINOR Jepson. *Dudleya minor* Rose, l.c. 3:19, type loc. San Gabriel Cañon, San Gabriel Mts., *Hasse. D. bernardina* Britt. Bull. N. Y. Bot. Gard. 3:19 (1903), type loc. San Bernardino Mts., *S. B. & W. F. Parish* 100. *D. ovatifolia* Britt. l.c. 3:20, type loc. Santa Monica Mts., *Hall* 3255. *D. pumila* Rose, Bull. N. Y. Bot. Gard. 3:14 (1903), type loc. San Bernardino Mts., *Hall* 1350.

5. **E. lanceolata** Nutt. DESERT SAVIOR. Plants 8 to 15 or 27 inches high, commonly glaucous; rosettes not dense; leaves spreading or ascending, narrowly lanceolate, quite thick or sometimes slightly teretish, scarcely widened above, 2 to 6 inches long, 2 to 9 lines wide, some outer ones often oblong; branches of the cyme several or most commonly few, racemose and simple or sometimes branched, 2½ to 4 inches long, the flowers obconic or cylindric, mostly discrete, sometimes rather few relatively; pedicels mostly 4 to 6 (or 8) lines long; petals yellow, greenish-yellow, or reddish, oblong or oblong-lanceolate, 4½ to 5½ lines long.

Rocky ground, 1000 to 4000 feet: Santa Barbara Co. to San Diego Co.; western Colorado Desert. South to Lower California. Apr.-July.

Field note.—Prospectors traveling over arid wastes chew the leaves of this plant when out of water. Some "desert rats" carry it in their packs as a resource in time of need. The leaves are a little bitter, but they often serve to tide over a period of stress or even to save life in dire extremity.

Locs.—Sisquoc, Santa Barbara Co., *M. S. Baker;* Santa Catalina Isl. (Erythea 7:139); Cahuenga Peak, *Chandler* 2007; near Claremont, *Crawford;* Fish Cañon, San Gabriel Mts., *Peirson* 518; Mill Creek, San Bernardino Mts.; San Gorgonio Pass, *Jepson* 6069; Whitewater Bridge, *Jepson* 11,668; Lookout Mt. near Piñon Well (n. of Indio), *Jepson* 6011; Riverside, *Jepson* 1222; Palm Cañon, San Jacinto Mts., *Jepson* 1349; Menifee, Riverside Co., *Alice King;* Indian Cañon, Collins Valley, *Jepson* 8856; Claymine Cañon, Santa Ana Mts., *J. T. Howell* 2637; Palomar, *Jepson* 1530; Wagon Wash near Sentenac Cañon, e. San Diego Co., *Jepson* 12,469; San Diego.

Var. **lurida** Munz. Plants 1¼ to 2½ feet high; leaves and flowering stems purplish-brown; flowers reddish, 5½ to 6 lines long.—Santa Monica Mts. (Rustic Cañon, *Peirson* 1934); Ventura Co. (Sespe Creek, *Peirson* 5768).

Var. **saxosa** Jepson comb. n. Plants 5 to 6 inches high; cyme small; calyx brick-red.—Panamint Mts.

Var. **composta** Jepson var. n. Cyme branches few, simple, very secund; pedicels 1 to 2 lines long; flowers 4 lines long.—(Cymae rami pauci, simplices, secundissimi; pedicelli lin. 1–2 longi; flores lin. 4 longi.)—Spruce Cañon, Mt. San Jacinto, *Jepson* 2285, type.

Var. **incerta** Jepson var. n. Somewhat slender, 9 to 12 inches high; cyme branches 3 or 4, simple and elongated or sparingly branched, the pedicels subequal (1½ to 2 lines long); petals reddish, slenderly lanceolate, 4½ to 5½ lines long, the tips tending to spread a little in age.—(Caules paulo graciles, unc. 9–12 alti; cymae rami 3–4, simplices et elongati, vel parce ramosi, pedicellis subaequantibus (lin. 1½–2 longis).—Sierra Nevada foothills in Calaveras Co., near Kentucky House on Calaveritas Creek, *Jepson* 9919, type.

Refs.—ECHEVERIA LANCEOLATA Nutt.; T. & G. Fl. 1:561 (1840), type loc. San Diego, *Nuttall;* Torr. Bot. Mex. Bound. 69, pl. 24 (1859). *Cotyledon lanceolata* B. & W. Bot. Cal. 1:211 (1876); Jepson, Man. 453 (1925). *Dudleya lanceolata* Britt. & Rose, Bull. N. Y. Bot. Gard. 3:23 (1903). *D. parishii* Rose, Bull. N. Y. Bot. Gard. 3:21 (1903), type loc. San Bernardino, *Parish. D. reflexa* Britt. N. Am. Fl. 22:36 (1905), type from S. Cal., *Mary T. Bryce.* (?) *D. abramsii* Rose, l.c. 14, type loc. near Jacumba, *Abrams,* "with nearly sessile flowers". *D. elongata* Rose, l.c. 28, type loc. near San Pedro, *Hasse. D. hallii* Rose, l.c. 17, type loc. Riverside, *Hall. E. hallii* Nels. & Mcbr. Bot. Gaz. 56:476 (1913). (?) *Dudleya angustiflora* Rose, l.c. 14, type loc. Daunt, Tulare Co., *Purpus. D. aloides* Rose, l.c. 15, type loc. San Felipe, San Diego Co., *T. Brandegee. D. grandiflora* Rose, l.c. 16, type loc. Whitewater, San Bernardino Mts., *T. Brandegee.* (?) *D. parishii* Rose, l.c. 21, type loc. near San Bernardino, *Parish,* pedicels 2 to 4 lines long (ex char.). *D. brauntonii* Rose, l.c. 24, type loc. Elysian Hills, Los Angeles, *Braunton* 869, 882. *D. congesta* Britt. Bull. N. Y. Bot. Gard. 3:25 (1903), type loc. "southern California", *Bryce;* a dwarf form which may belong here. *D. delicata* Rose, l.c. 24, type loc. Spencer Valley near Julian, *Abrams.* Var. LURIDA Munz, Man. S. Cal. Bot. 213 (1935). *Dudleya lurida* Rose, l.c. 22, type loc. Santa Monica Mts. Var. SAXOSA Jepson. *Cotyledon lanceolata* var. *saxosa* Jepson, Man. 453 (1925). *Cotyledon saxosa* Jones, Contrib. W. Bot. 8:28 (1898), type loc. Panamint Cañon, Panamint Range, *Jones. Dudleya saxosa* Britt. & Rose, Bull. N. Y. Bot. Gard. 3:15 (1903). *E. saxosa* Nels. & Mcbr. Bot. Gaz. 56:476 (1913). Var. COMPOSTA Jepson. Var. INCERTA Jepson.

6. **E. viscida** Berger. STICKY LETTUCE. Stems 10 to 17 inches high; leaves of the rosette narrowly linear-lanceolate, flat, 1 to 2½ lines wide, attenuate upwards from a very broad (6 to 8 lines wide) sessile base, 2 to 3 inches long, glabrous but very viscid; cyme flat-topped or elongated and thyrsoid; petals yellowish and usually somewhat reddish.

Rocky places near the coast, 5 to 700 feet: Orange Co. to San Diego Co. June.

Locs.—San Juan Capistrano Hot Sprs.; Oceanside, *Parish* 4453.

Var. **insularis** Jepson comb. n. Plants not viscid, usually glaucous.—Dry cliffs, Santa Barbara Isls.: Santa Catalina Isl., *Reed* 2797; San Clemente Isl., *T. Brandegee.*

Refs.—ECHEVERIA VISCIDA Berger; Engler & Prantl, Nat. Pflzfam. ed. 2, 18a:480 (1930). *Cotyledon viscida* Wats. Proc. Am. Acad. 17:372 (1882), type loc. Hot Springs at San Juan Capistrano, Orange Co., *Nevin;* Parish, Erythea 6:88 (1898); Jepson, Man. 453 (1925). *Stylophyllum viscidum* Britt. & Rose, Bull. N. Y. Bot. Gard. 3:33 (1903). Var. INSULARIS Jepson. *Cotyledon viscida* var. *insularis* Jepson l.c. *Stylophyllum insulare* Rose, Bull. N. Y. Bot. Gard. 3:34 (1903), type loc. Santa Catalina Isl., *Blanche Trask. S. virens* Rose, l.c., type loc. San Clemente Isl., *Blanche Trask. S. albidum* Rose, l.c., type loc. San Clemente Isl., *T. Brandegee.*

S. traskae Rose, l.c., type loc. Santa Barbara Isl., *Blanche Trask.* *S. hassei* Rose, l.c., 35, type loc. Santa Catalina Isl., *Hasse.*

7. **E. edulis** Berger. Mission Lettuce. Plants 1 to 1½ feet high; leaves linear-attenuate, quite thick but flat above, though rounded beneath, glaucous, dilated and flattened at base, 2 to 3 inches long; stem leaves small; cyme paniculate, 2 to 9 inches long, or reduced to 1 or 2 spreading branches; petals white or nearly so, oblong-lanceolate, rotately spreading from just below the middle, the median ridge on back widened to a distinct wing below.

Dry cliffs, 50 to 2500 feet: cismontane San Diego Co. June.

Locs.—San Diego, *Jepson* 1590, *H. P. Kelley;* Dulzura to Campo, *T. Brandegee;* San Diego River Falls, *T. Brandegee.*

Var. **attenuata** Jepson comb. n. Slender; cyme of 2 or 3 spreading branches, or with 1 or 2 small or supplementary lateral ones; petals "yellow".—Southwestern San Diego Co. (Initial Monument) and southward into Lower California.

Refs.—Echeveria edulis Berger; Engler & Prantl, Nat. Pflzfam. ed. 2, 18a:481 (1930). *Cotyledon edulis* Brew.; B. & W. Bot. Cal. 1:211 (1876); Jepson, Man. 453 (1925). *Sedum edule* Nutt.; T. & G. Fl. 1:560 (1840), type loc. San Diego, *Nuttall.* *Stylophyllum edule* Britt. & Rose, Bull. N. Y. Bot. Gard. 3:36 (1903). *Stylophyllum parishii* Britt. Bull. N. Y. Bot. Gard. 3:37 (1903), type loc. Pala, San Diego Co., *Parish.* (?) *Stylophyllum semiteres* Rose, Bull. N. Y. Bot. Gard. 3:35 (1903), the type coll. by *Orcutt,* either in L. Cal. or the Colorado Desert. Var. attenuata Jepson. *Cotyledon edulis* var. *attenuata* Jepson, Man. 453 (1925). *Cotyledon attenuata* Wats. Proc. Am. Acad. 22:472 (1887), type from San Quentin Bay, L. Cal., *Orcutt.* *Stylophyllum attenuatum* Britt. & Rose, Bull. N. Y. Bot. Gard. 3:36 (1903). *Stylophyllum orcuttii* Rose, Bull. N. Y. Bot. Gard. 3:36 (1903), type loc. Initial Monument, *T. Brandegee;* corolla-segments rose-color (ex char.).

8. **E. densiflora** Berger. White Lettuce. Plants 6 to 12 inches high, very white-glaucous; leaves terete, or somewhat oval in section, 2½ to 6 inches long; cyme compound, rounded, densely flowered, 2½ to 4 inches wide; calyx-lobes obtuse; petals white or pinkish, lanceolate, distinct nearly or quite to the base.

Cañon walls, 900 to 2000 feet: San Gabriel Mts. June-July. A remarkable and highly localized species.

Locs.—Fish Cañon, *Peirson* 517; San Gabriel Cañon.

Refs.—Echeveria densiflora Berger; Engler & Prantl, Nat. Pflzfam. 18a:481 (1930). *Stylophyllum densiflorum* Rose, Bull. N. Y. Bot. Gard. 3:36 (1903), which rests on *Cotyledon nudicaule* Abrams, Bull. S. Cal. Acad. 2:42 (1903), type loc. San Gabriel Cañon, *Abrams,* not C. nudicaulis Lam. (1786). *Cotyledon densiflora* Fedde; Just, Bot. Jahrb. 31^1:829 (1904); Jepson, Man. 453 (1925).

SAXIFRAGACEAE. Saxifrage Family

Perennial herbs or shrubs. Flowers perfect, perigynous, usually white, often red, never blue, borne in racemes, panicles or cymes, or solitary. Calyx 5-lobed or -cleft. Petals commonly 5, sometimes 4 to 8. Stamens 5 or 10, sometimes 3, or 8 to 20, or numerous. Pistil 1; ovary partly or wholly inferior, or superior, 1 to 5-celled, the styles or stigmas as many as the cells or placentae, the latter either parietal or axile. Fruit a capsule, follicle, or berry. Seed with endosperm. Stipules (in ours) none except in Lithophragma, Peltiphyllum and Ribes, and sometimes in Boykinia. Aestivation imbricate. Stamens inserted with the petals.—Species 600 in 70 genera, north temperate (especially alpine) and arctic zones, also a few in north Africa and a few in the Andes as far south as the straits of Magellan.

Bibliog.—Engler, A., Index criticus specierum atque synonymorum generis Saxifraga L. (Verhandlung zool. bot. Ges. Wien. 19: 513–558,—1869). Wheelock, W. E., Descriptive list of species of the genus Heuchera (Bull. Torr. Club 17:191–204,—1890). Small, J. K., Two new genera of Saxifragaceae (Bull. Torr. Club 23:18–20,—1896). Wheelock, W. E., List of species of the smaller herbaceous genera of N. Am. Saxifragaceae (Bull. Torr. Club 23:67–78,—1896). Koehne, E., Philadelphus (Gartenfl. 45:450–462,—1896). Rose, J. N., Preliminary revision of the N. Am. species of Chrysosplenium (Bot. Gaz. 23:274–277,—1897). Rosendahl, C. O., Die nordamerikanischen Saxifraginae und ihre Verwandtschafts-Verhältnisse in Beziehung zu ihre geographischen Verbreitung (Engler, Bot. Jahrb. 37: beibl. 83:1–87, t. 4–5.—1905). Small, J. K., and Rydberg, P. A., Saxifragaceae, Hydrangeaceae in N. Am. Fl. 22:1–180,—1905.

A. Fruit a capsule; ovary superior or partly inferior.

- Styles 2, distinct; leaves alternate, or mostly basal (in no. 13 opposite, in ours), without stipules (but see nos. 4, 5 and 8); herbs.—Tribe SAXIFRAGEAE.
  - Sterile filaments none.
    - Ovary 2-celled and placentae axile.
      - Stamens 10; ovary slightly inferior or free.
        - Leaves not peltate.
          - Flowers appearing with or after the leaves; stems from rootstocks or fibrous roots.
            - Petals ovate to roundish; petioles not jointed with the blades.............. 1. SAXIFRAGA.
            - Petals spatulate; petioles jointed with the blades, persistent on the rootcrown.............. 2. SAXIFRAGOPSIS.
          - Flowers appearing before the leaves; stems from a corm-like root; petals spatulate.............. 3. JEPSONIA.
        - Leaves peltate, 1 to 2 feet broad.............. 4. PELTIPHYLLUM.
      - Stamens 5.
        - Petals deciduous; ovary ½ to ¾ adherent to the calyx.............. 5. BOYKINIA.
        - Petals persistent; ovary superior.............. 6. BOLANDRA.
    - Ovary 1-celled with 2 parietal placentae alternate with the styles or stigmas.
      - Petals 5.
        - Stamens 10.
          - Petals entire, almost filiform; capsule early and unequally 2-valved to the base.............. 7. TIARELLA.
          - Petals usually laciniate or toothed; capsule equally 2-valved.
            - Petals white or pink, clawed; styles 3; rootstocks slender, tuberous.............. 8 LITHOPHRAGMA.
            - Petals red, sessile; styles 2; rootstock stout, not tuberous..9. TELLIMA.
        - Stamens less than 10
          - Petals cleft or pinnatifid; stamens 5 (in ours).............. 10. MITELLA.
          - Petals entire.
            - Calyx campanulate or turbinate; stamens 5; capsule 2-beaked with the styles but not lobed.............. 11. HEUCHERA.
            - Calyx tubular; stamens 3; capsule deeply 2-lobed, the beaks strongly diverging.............. 12. TOLMIEA.
      - Petals none; stamens 8.............. 13. CHRYSOSPLENIUM.
  - Sterile filaments present; ovary 1-celled with 3 or 4 parietal placentae opposite as many stigmas; fertile stamens 5.............. 14. PARNASSIA.
- Styles 3 to 5, distinct, or more or less united into one; fruit a capsule; leaves opposite, without stipules; shrubs.—Tribe HYDRANGEAE.
  - Stamens 20 to numerous; seeds numerous; styles persistent.
    - Styles 3 to 5, distinct at least at apex; ovary inferior, completely 3 to 5-celled; capsule obconic or obovoid.............. 15. PHILADELPHUS.
    - Style 1, short; ovary half-inferior, imperfectly 5 (2 to 8)-celled; capsule depressed-globose or ovoid.............. 16. CARPENTERIA.
  - Stamens less than 20; styles 3 to 5.
    - Styles persistent; stamens 10; calyx-lobes pubescent; flowers (in ours) pink, in cymes.............. 17. JAMESIA.
    - Styles deciduous; stamens 8 to 12; calyx-lobes glabrous; flowers white, in racemes.............. 18. WHIPPLEA.

B. Fruit a berry; ovary wholly inferior.

- Leaves alternate, with stipules; styles 2, or more or less united into one; shrubs.—Tribe GROSSULARIAE.............. 19. RIBES.

1. SAXIFRAGA L. SAXIFRAGE

Herbs, the leaves entirely or mainly in a basal cluster. Flowers white, in panicles or close or capitate cymules. Calyx cohering with the base of the ovary or almost free, 5-cleft or -parted. Petals entire, commonly deciduous. Stamens 10. Styles 2. Capsule 2-beaked, 2-celled, opening down or between the beaks, or sometimes the fruit consists of 2 nearly separate follicles. Seeds numerous. (Latin saxum, a rock, and frango, to break.)

Bibliog.—Engler, A., Monographie der Gatt. Saxifraga L. mit besonderer Berucksichtigung der geographischen Verhaltnisse (1–292, map,—1872). Gray, A., Notes on some N. Am. species of Saxifraga (Proc. Am. Acad. 20:8–12,—1884). Small, J. K., New and noteworthy species of

Saxifraga (Bull. Torr. Club 23:366,—1896). Greene, E. L., Two Californian Saxifrages (Bull. Torr. Club 23:25—1896). Gunthart, A., Beiträge zur Blütenbiologie der Gattung Saxifraga (Biblio. Bot. 11^{58}:63–94,—1902). Engler, A., and Irmscher, E., Saxifragaceae-Saxifraga (Engler, Pflzr. 4^{117}:1–709, figs. 1–124,—1916). Engler, A., Saxifraga (Engler, Pflzr. 4^{117}: pars gen. 1–47, figs. 1–4,—1918). Johnson, A. M., Revision of the N. Am. species of the sect. Boraphila, genus Saxifraga (Univ. Minn. Stud. Biol. Sci. 4:1–109, pls. 1–19,—1923); Studies in Saxifraga. I. (Am. Jour. Bot. 14:323–326, pls. 40–47,—1923); II. (l.c. 18:797–802, pls. 53–54,—1931).

- Stems with the leaves all basal or nearly so.
  - Inflorescence without bulblets; perennials.
    - Leaves not orbicular or cordate.
      - Petals not spotted.
        - Leaves commonly glabrous, at least on upper surface; petioles mostly short.
          - Calyx-lobes erect.
            - Plants 1 to 3 feet high; flowers in an elongated panicle..1. *S. oregana.*
            - Plants 2 to 14 inches high.
              - Scapes glabrous except at base; flowers in a single terminal capitate cyme........2. *S. aprica.*
              - Scapes glandular-pubescent; cymules in a commonly narrow panicle, rarely capitate........3. *S. nidifica.*
          - Calyx-lobes reflexed; cymules in a loose panicle........4. *S. fallax.*
        - Leaves commonly with soft scattered hairs on the upper surface; petioles ¼ to as long as or longer than the blades; flowers in an open panicle; calyx-lobes reflexed or becoming reflexed........5. *S. californica.*
      - Petals with 2 yellow-green spots near the base; filaments petaloid....6. *S. marshallii.*
    - Leaves orbicular or cordate; petiole longer than the blade.
      - Stems not scapose, the stems commonly 1 or 2-flowered........7. *S. rivularis.*
      - Stems scapose, bearing many-flowered panicles.
        - Scapes from a more or less horizontal rootstock; leaves simply crenate or serrate........8. *S. punctata.*
        - Scapes from an erect bulb-like scaly root-crown; leaves doubly serrate........9. *S. mertensiana.*
  - Inflorescence with bulblets; high montane.
    - Perennial; stoutish plant 6 to 11 inches high; rare in Cal........10. *S. bongardii.*
    - Annual; delicate or slender plant 2 to 8 inches high, frequent........11. *S. bryophora.*
- Stems densely and equably clothed with linear leaves; caespitose alpine plants........12. *S. tolmiei.*

1. **S. oregana** Howell. MARSH SAXIFRAGE. Scapes stoutish, 12 to 22 inches high; stems pubescent, the upper part glandular; leaf-blades obovate to oblanceolate-spatulate, 2 to 7 inches long, narrowed at base to a margined petiole, mostly glabrous, sometimes ciliate; flowers in small thick clusters in a narrow thyrse-like panicle; petals obovate to oblong-obovate, 1½ lines long.

Swamps or marshy meadows, 3500 to 7400 feet: Sierra Nevada from Tulare Co. to Siskiyou Co. North to Washington. June-Aug.

Tax. note.—These plants of the Sierra Nevada montane meadows, hitherto called Saxifraga integrifolia Hook. (Fl. Bor. Am. 1:249 t. 86,—1834), a low valley species of Oregon and Washington, are here referred to S. oregana Howell. In S. oregana the leaves are larger, widest towards the apex and taper insensibly or abruptly to the base, whereas in S. integrifolia the leaves are broadest at base and tend to be ovate or oblong, so that the base of the blade is usually rounded or obtuse. The rootstock of S. oregana is, furthermore, heavier and the leaf-bases are broad and thin and do not develop in age a fine somewhat wire-like thatch at base of stem as in S. integrifolia. While the leaves in S. oregana vary from entire or denticulate to markedly serrate, and from forms with a long petiole-like base to subsessile or sessile, such range of variation is, however, not significant and represents a very ordinary sort of variation in many Saxifraga species. The var. sierrae (Cov.) with "sessile" leaves we hold an inconsiderable form.

Locs.—Freeman Creek, Tulare Co., *Jepson* 4885; Giant Forest, *K. Brandegee;* Horse Corral Mdw., King's River, *Jepson* 768; Huckleberry Creek, Huntington Lake, *Jepson* 13,076; Strawberry, South Fork Stanislaus River, *Jepson* 6524; Kennedy Lake, Tuolumne Co., *A. L. Grant* 330; Myers sta., Eldorado Co., *Ottley* 960; Colby, Butte Co., *R. M. Austin;* ridge n. of Hot Springs Valley, Lassen Peak, *Jepson* 12,297; Pine Creek, Lassen Co., *M. S. Baker;* Bear Valley Mts., Modoc Co., *M. S. Baker* 564; Twelve-mile Creek, e. side Mt. Bidwell, *Manning;* Deadhorse Cañon, Siskiyou Co., *M. S. Baker;* Sisson, *Jepson* 13,476; Marble Mt., Siskiyou Co., *Chandler* 1548.

Refs.—SAXIFRAGA OREGANA Howell, Erythea 3: 34 (1895), "mountain marshes of Oregon", *Howell. S. integrifolia* Jepson, Man. 455, fig. 446 (1925), not Hook. *Micranthes integrifolia* Small, N. Am. Fl. 22:137 (1905) in part. *S. integrifolia* var. *sierrae* Cov. Proc. Biol. Soc. Wash.

7:78 (1892), type loc. 8 mi. nw. of Whitney Mdws., Kern River, *Coville* 1705. *S. sierrae* Small, Bull. Torr. Club 23:366 (1896). *Micranthes sierrae* Hel. Muhl. 2:52 (1905). *M. montana* Small, N. Am. Fl. 22:138 (1905), type loc. Pyramid Peak, *F. M. Meigs* (this rests on ovate, not obovate petals).

2. **S. aprica** Greene. SIERRA SAXIFRAGE. (Fig. 147.) Plants mostly purplish, 1½ to 4½ inches high; scapes glabrous or subglabrous, but sparingly pubescent with gland-tipped hairs at base; pedicels glabrous; leaf-blades oblong-ovate or spatulate-obovate, dentate to entire, glabrous, 3 to 13 lines long, subsessile or shortly petioled; flowers small, capitate, the heads 2 to 5 lines wide; petals ovate, oblong or spatulate, little exceeding the erect calyx-lobes; stamens filiform; styles very short.

High montane, dry stony places, 7000 to 11,200 feet: Sierra Nevada from Tulare Co. to Tehama Co. July-Oct.

Locs.—Above Mineral King (Contrib. U. S. Nat. Herb. 4:98); Kearsarge Pinnacles, *Jepson* 847; Ruby Lake, nw. Inyo Co., acc. *Peirson;* Kaiser Peak, *A. L. Grant* 1442; Mt. Lyell, *Jepson* 3326; Mt. Dana, *F. P. McLean;* Grass Lake, Fallen Leaf, *Pendleton & Reed* 1021; Mt. Tallac, *Ottley* 782; Donner Lake, *Sonne* 354; Lassen Peak, *R. M. Austin* 405.

Refs.—SAXIFRAGA APRICA Greene, Bull. Torr. Club 23:25 (1896). *S. umbellulata* Greene, Erythea 1:122 (1893), type loc. Donner Pass, *Greene,* not S. umbellulata Hook. f. & Thoms. (1858). *Micranthes aprica* Small, N. Am. Fl. 22:136 (1905). Our plant has been described under the name *S. nivalis* by Brewer & Watson (Bot. Cal. 1:194), by Greene (Fl. Fr. 189) and by Jepson (Man. 455). S. nivalis L. is arctic and circumpolar, but extends in modified forms southward in high mountains to the temperate zone. Linnaeus doubtless knew best the plant of the Scandinavian region. That plant is noticeably villous, both on the stem and leaves; the leaves are disposed to be broadly ovate, coarsely crenate at the middle and above, with a cuneatish base; the inflorescence is paniculate, though sometimes condensed and subcapitate. While very closely allied, the two species, S. nivalis L. and S. aprica Greene, are unlike in their broader aspects, though most differences are inconstant save that of pubescence.

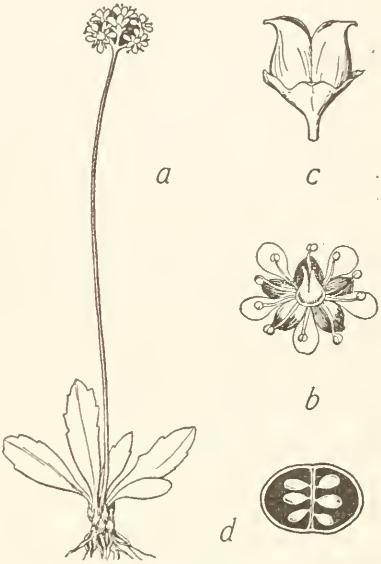

Fig. 147. SAXIFRAGA APRICA Greene. *a,* habit, × 1; *b,* fl., × 4; *c,* fr., × 4; *d,* cross sect. of ovary, × 10.

3. **S. nidifica** Greene. PEAK SAXIFRAGE. Scapes 5 to 13 inches high, pubescent with short spreading gland-tipped hairs; leaf-blades ovate, entire or merely denticulate, ½ to 1½ inches long, commonly glabrous, sometimes slightly villous, narrowed to a broad petiole; flowers disposed in cymules, the cymules borne in a commonly narrow panicle; branches of the panicle pubescent like the scape, the pedicels commonly glabrous, sometimes slightly glandular-pubescent; petals roundish-obovate, ¾ to 1¼ lines long.

Wet meadows, wet rocks or by streamlets, 2000 to 9500 feet: Sierra Nevada from Tulare Co. to Modoc Co.; North Coast Ranges from Lake Co. to Siskiyou Co. June-July.

This species is closely allied to Saxifraga aprica and is very variable, so that the differences between the two species tend to disappear, saving only that of pubescence. Even this remaining distinction is, however, one merely of degree and not of kind. In the Sierra Nevada at high altitudes the inflorescence may sometimes become much condensed or even capitate (as in plants from Denels Peak), thus resembling S. aprica. In the Coast Ranges the scapes sometimes become quite glandular, a condition well shown in specimens from Lake Co. The leaves of S. nidifica tend to have a narrow reddish margin.

Locs.—Sierra Nevada: Denels Peak, Tulare Co., *Hall & Babcock* 5519; Black Mt., Fresno Co., *Hall & Chandler* 612; Glacier Pt., Yosemite, *Hall* 9143; Angora Lake, Eldorado Co., *M. S. Baker;* Truckee road to Tahoe, *Sonne* 90; Forestdale, Big Valley, Modoc Co., *M. S. Baker;* Warner Range, Modoc Co., *Manning* 33. North Coast Ranges: Kelseyville, Lake Co., *Blankinship;*

Middletown, Lake Co., *Mason* 2767; Buck Mt., Humboldt Co., *Tracy* 4178; Trinity Summit, *Davy & Blasdale* 5815; Marble Mt., *Chandler* 1675; Edgewood, Siskiyou Co., *J. W. Kisling.*

Refs.—SAXIFRAGA NIDIFICA Greene, Erythea 1:222 (1893), type loc. high Sierra Nevada, *Greene*, probably near Summit sta., Donner Pass, since this is the only high Sierran region visited by Greene; Jepson, Man. 456 (1929). *Micranthes nidifica* Small, N. Am. Fl. 22:134 (1905).

4. **S. fallax** Greene. Slide Saxifrage. Plants 6 to 13 inches high, resembling S. nidifica very closely but the inflorescence more open, the branches of the panicle ½ to 2 inches long, and the flowers smaller.

Montane, on cool shady slopes, 5000 to 7500 feet: Fresno Co. to Lassen Peak. July. This species grows at somewhat lower altitudes than S. nidifica in the Sierra Nevada but differs only slightly from it.

Locs.—Bald Mt., Dinkey Creek, Fresno Co., *Hall & Chandler* 386; Eagle Peak, Yosemite, *Chesnut & Drew;* Snow Creek trail, Yosemite, *Jepson* 4383.

Refs.—SAXIFRAGA FALLAX Greene, Bull. Torr. Club 23:25 (1896), based on spms. from Lassen Peak, *R. M. Austin*, and Summit sta. (above Donner Lake), *Greene*. *Micranthes fallax* Small, N. Am. Fl. 22:141 (1905). *S. virginiensis* var. *californica* Hall, Yos. Fl. 117 (1912) not S. californica Greene. *S. californica* var. *nidifica* Engl. & Irm.; Engler, Pflzr. 4^{117}:44 (1916).

5. **S. californica** Greene. California Saxifrage. Scape 6 to 11 inches high, thinly pubescent with gland-tipped hairs; leaf-blades ovate to elliptic, rather sparingly denticulate to strongly serrate, somewhat undulate, ½ to 2 inches long, thinly pilose above, usually pilose-ciliate, the under side glabrous, borne on petioles commonly ½ to as long; panicle open; lobes of the calyx ovate, becoming reflexed in late anthesis or in fruit; petals elliptic or obovate, 1½ to 2 lines long; filaments not dilated; carpels almost distinct.

Shaded rocky moist places in the low hills and valleys, 50 to 2500 feet: coastal Southern California (but rare); Coast Ranges from San Luis Obispo Co. to Humboldt Co.; Sacramento Valley; Sierra Nevada from Tuolumne Co. to Placer Co. Mar.-June.

The most important point of difference between the Californian plant and S. virginiensis of the Atlantic coast is held to reside in the reflexed calyx-lobes of the former and the erect calyx-lobes of the latter. Californian plants in full anthesis often have erect calyx-lobes (Vaca Mts., *Jepson* 13,477) which do not become reflexed until after early anthesis or in fruit. The mature carpels are often quite as diverging in Californian plants as in those of the Atlantic states. E. L. Greene (Pitt. 1:286) stressed the importance of the tubers which are developed on the ends of filiform runners in S. californica as a differentiating character. These slender stolons are significant structures biologically, although but few collectors have taken the trouble to demonstrate them in their specimens. Small says (Bull. Torr. Club 23:363) that they are likewise present in S. virginiensis Michx. While S. californica is here given specific rank, it is held to be closely allied to S. virginiensis. At one time (Proc. Am. Acad. 20:11) our Californian plant was referred to S. reflexa Hook. (Fl. Bor. Am. 1: 249, t. 85—1834), but this is an arctic species with the filaments commonly dilated upward. S. californica, on the contrary, has narrowly linear filaments and is distinctly a species of the Californian lowlands.

The upper surface of the leaf bears weak shortly jointed hairs which are scattered but rather conspicuous, not straight but uniform in structure, though sometimes very scanty in number. The under side of the leaf is usually glabrous. The petiole varies markedly in length; sometimes as long as the blade, sometimes ¼ as long, it is perhaps more commonly ½ as long, though it may vary widely in one collection. In some plants of the middle Coast Range hilltops the petiole is often very short or scarcely obvious. Plants of such habitats incline to have calyx-lobes of a deeper red than usual.

Locs.—S. Cal.: San Diego, *W. S. Wright* 13; Reche Cañon, Colton, *Parish;* Arroyo Seco, Los Angeles (Erythea 2:79); Rattlesnake Cañon, Santa Barbara, *Jepson* 9124. Coast Ranges: Arroyo Grande, San Luis Obispo Co., *Alice King;* Little Sur, Monterey coast, *Davy* 7376; Loma Prieta, *Davy* 423; Isabel Creek, Mt. Hamilton Range, *Chandler* 6034; Mt. Tamalpais, *Greene;* Fish Ranch, Berkeley Hills, *Chandler* 565; Laundry Farm, Oakland Hills, *Davy;* Mt. Diablo, *E. W. Hicks* 107; Vaca Mts., *Jepson* 13,477; Atlas, Napa Range, *Mary Ferguson* 211; Hoods Peak, e. Sonoma Co., *Bioletti;* Calistoga Pinnacles, *Jepson* 13,478; Skaggs Sprs., Sonoma Co., *Henry Edwards;* Cazadero, *Davy* 1663; Cold Creek, Kelseyville, *Hardin Irwin* 25; Ukiah, *Purdy;* Potter Valley, Mendocino Co., *Nettie Purpus;* Kneeland Prairie, Humboldt Co., *Tracy* 4063. Sierra Nevada: Columbia, *A. L. Grant* 604; Kyburz, South Fork American River, *Francis Ramaley* 11,286; Salmon Falls, Eldorado Co., *Jepson* 15,758; Auburn, *M. S. Baker;* Newcastle, Placer Co., *Sonne* 4267. Sacramento Valley: Fair Oaks, *M. S. Baker;* Marysville Buttes, *Jepson.*

Refs.—Saxifraga californica Greene, Pitt. 1:286 (1889), type loc. Mission Hills, San Francisco, *Greene. Micranthes californica* Small, N. Am. Fl. 22:140 (1905). *S. virginiensis* Bol. Cat. Pl. S. F. 11 (1870); B. & W. Bot. Cal. 1:194 (1876). *S. virginiensis* L. var. *californica* Jepson, Fl. W. Mid. Cal. 268 (1901), ed. 2, 198 (1911), Man. 456 (1925). *S. virginiensis* L. var. *napensis* Jepson, Man. 456 (1925). *S. napensis* Small, Bull. Torr. Club 25:316 (1898), type loc. Napa Valley, *Bigelow, Thurber* 496, "corolla white". *Micranthes napensis* Small, N. Am. Fl. 22:140 (1905), the flower said in this work to be without corolla, but perhaps the petals had fallen.

6. **S. marshallii** Greene. Hupa Saxifrage. Plants 4 to 12 inches high; scape and leaves from a short caudex; leaf-blades oblong or ovate, rather coarsely dentate, ½ to 1½ inches long, on petioles about as long.

Montane, 5000 to 7000 feet: Humboldt and Siskiyou Cos. North to southern Oregon. May-June.

Locs.—Trinity Summit; Marble Valley, Siskiyou Co., *Butler* 24. Oregon: Woodville, *Howell.*

Refs.—Saxifraga marshallii Greene, Pitt. 1:159 (1888), type collected by *C. C. Marshall* on Supply Creek, w. of Hupa Valley, at considerable altitude, not far below the snow, Humboldt Co., acc. *J. P. Tracy* in litt. Jan. 14, 1935, not "Hupa Valley" as stated by Greene; Jepson, Man. 456 (1925). *Micranthes marshallii* Small, N. Am. Fl. 22:145 (1905).

7. **S. rivularis** L. Pigmy Saxifrage. (Fig. 148.) Plants ½ to 2 inches high, the leaves mainly basal; stems erect, nearly twice as long as the basal leaves, 1 or 2 (to 5) -flowered, bearing one (or few) scattered leaves; herbage minutely glandular-puberulent save the upper side of the leaves; blades of basal leaves 1 to 3 lines wide, somewhat reniform in outline, 3-lobed, the lobes broad, subobtuse, the petioles 4 to 12 lines long; cauline leaves mostly sessile, entire or slightly lobed; flowers 2 lines long; petals oblong; tips of capsule widely divergent.

Wet and shady places under rocks, 11,500 feet: southern Sierra Nevada in Inyo Co. East to New Hampshire, north to Alaska and Greenland. Europe, Asia. Aug.

Loc.—Ruby Lake, Rock Creek, *Peirson* 10,765.

Ref.—Saxifraga rivularis L. Sp. Pl. 404 (1753), type loc. Lapland.

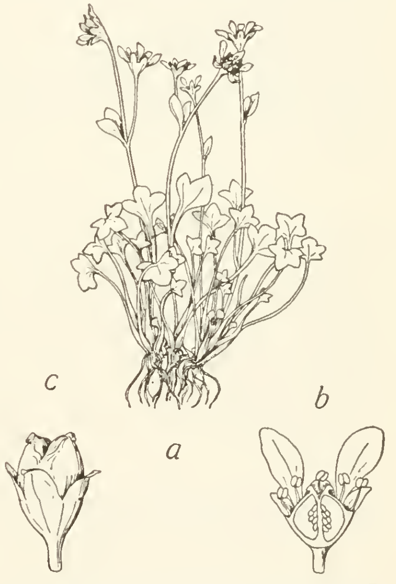

Fig. 148. Saxifraga rivularis L. *a*, habit, × 1; *b*, long. sect. of fl., × 4; *c*, capsule, × 3.

8. **S. punctata** L. var. **arguta** Engl. & Irm. Brook Saxifrage. Plants 9 to 18 inches high, scape and leaves from a short creeping rootstock; herbage glabrous or somewhat pubescent; leaf-blades reniform to round-cordate, almost equally dentate, ¾ to 2½ inches broad; petioles 2 to 6½ inches long; panicle open, narrow; calyx-lobes closely reflexed.

Along brooks, 7000 to 10,300 feet: San Bernardino Mts.; Sierra Nevada from Tulare Co. to Lassen Peak; Yollo Bolly Mts. to Trinity Mts. North to Alaska.

Note on the flower.—The white petals have two yellow dots near the base of the orbicular limb. The stamen-filaments are clavate. The purple upper half of the ovary is sharply defined from the whitish part below.

Locs.—San Bernardino Mts.: San Gorgonio Peak (n. base), *C. M. Wilder.* Sierra Nevada: Farewell Gap, *Purpus* 5252; Ruby Lake, nw. Inyo Co., acc. *Peirson;* Home Camp Creek, Huntington Lake, *A. L. Grant* 1419; Rancheria Mt., *Jepson* 4599; Tilden Lake, Tuolumne Co., *Jepson* 4546; Sonora Pass, *A. L. Grant* 300; Coldstream, Placer Co., *Sonne* 91. Coast Ranges: South Yollo Bolly, *Jepson* 13,479; Marble Valley, Siskiyou Co., *Butler* 222. Ore.: Ashland Butte, *Jepson* 2572.

Refs.—SAXIFRAGA PUNCTATA L. Sp. Pl. 401 (1753), type loc. Siberia. Var. ARGUTA Engl. & Irm.; Engler, Pflzr. 4^{117}:11 (1916). *S. arguta* Don, Trans. Linn. Soc. 13:356 (1821), type loc. "Northwest Coast", *Menzies*. *S. punctata* B. & W. Bot. Cal. 1:195 (1876), and older North American authors generally. *Micranthes arguta* Small, N. Am. Fl. 22:147 (1905). *S. aestivalis* T. & G. Fl. 1:567 (1840); Jepson, Man. 455, fig. 445 (1925). *S. odontophylla* Piper, Contrib. U. S. Nat. Herb. 11:314 (1906), type loc. Mt. Stuart, *Sandberg & Leiberg* 570. Of more recent authors, Rosendahl (Engler, Bot. Jahrb. 37: beibl. 71,—1905) regards S. aestivalis Fisch. (F. & M. Ind. Sem. Hort. Petrop. 1:37,—1835) as the equivalent of the Siberian S. punctata L.

9. **S. mertensiana** Bong. WOOD SAXIFRAGE. Plants 4 to 14 inches high; scapes from a scaly bulb-like rootstock; petioles and scapes glandular-hairy; leaf-blades orbicular, cordate at base, crenately toothed, ¾ to 3¼ inches broad; petioles scarious-dilated at base, 1 to 6 inches long; panicle open, often bearing granule-like bulblets in the axils; flowers pendulous after anthesis (the slender pedicels recurved only at the very tip); calyx-tube very short, its lobes oblong, reflexed in fruit; filaments dilated toward the summit, white and petal-like; carpels half-united or a little more.

Moist woods or mossy cliffs: Coast Ranges from Sonoma Co. to Del Norte Co.; Sierra Nevada in Mariposa and Nevada Cos. North to Alaska. Mar.-May.

Locs.—North Coast Ranges, 500 to 2000 feet: Cazadero, *Heller* 6616; Bodega Pt., acc. *Eastwood;* Austin Creek, Sonoma Co., *Davy* 1667; Gualala River, *M. S. Baker* 762; Mill Creek near Ukiah, *Bolander* 4652; Idol House, n. Mendocino Co., *Chandler* 1070; Martin Ranch, South Fork Trinity River, *Tracy* 6009; Hupa, *Manning;* Gasquet, Del Norte Co., *Howell* 1428. Sierra Nevada, 4000 to 5000 feet (rare): Ledge Trail, Yosemite, *Chandler & Babcock* 1028; Emigrant Gap (Engler, Pflzr. 4^{117}:15).

Refs.—SAXIFRAGA MERTENSIANA Bong. Veg. Sitch. 141 (1832), type loc. Sitka, Alas., *Mertens;* Fl. W. Mid. Cal. 268 (1901), ed. 2, 198 (1911), Jepson, Man. 456 (1925). *Heterisia mertensiana* Small, N. Am. Fl. 22:156 (1905). *Heterisia eastwoodiae* Small, N. Am. Fl. 22:156 (1906), type loc. South Fork Smith River, Del Norte Co., *Eastwood*, a form in which the branchlets are scarcely bulblet-bearing. *S. mertensiana* var. *eastwoodiae* Engl. & Irm.; Engler, Pflzr. 4^{117}:15 (1916).

10. **S. bongardii** Presl. ALASKA SAXIFRAGE. Plants 6 to 11 inches high, the 1 to 3 stems scape-like, arising from the basal tuft of leaves, the leaves of the inflorescence reduced and bract-like; herbage thinly puberulent, the leaves more or less ciliate; leaf-blades narrowly oblong to oblanceolate, serrate above, contracted gradually downward to a somewhat petiole-like or narrowly cuneate base, the whole ½ to 1¾ inches long; inflorescence paniculate, with many bulblets but usually with a single flower terminating the branchlets; flowers 3 to 4 lines wide; petals white, the 3 upper lanceolate ones slightly different from the 2 lower spatulate-elliptic ones.

Dry rocky places, 4000 to 5000 feet: Siskiyou Mts. North to Alaska and Montana. July.

Loc.—Preston Peak (Madroño 2:36).

Refs.—SAXIFRAGA BONGARDII Presl, Verh. Zool. Bot. Ges. Vienna 19:528 (1869), type loc. Sitka, *Bongard;* Piper, Contrib. U. S. Nat. Herb. 11:315 (1906).

11. **S. bryophora** Gray. BUD SAXIFRAGE. Plants 2 to 8 inches high, the scape ending in a raceme or slender panicle; leaf-blades linear-oblong, acute, 3 to 8 lines long, sessile or subsessile; pedicels soon deflexed; flowers solitary and terminal, those along the axis or branches of the inflorescence replaced by leaf-buds or bulblets which fall to the ground and reproduce the species vegetatively; calyx free from the almost distinct ovaries, its lobes soon reflexed; petals 2-spotted toward the base.

High montane, in moist gravelly soil, 8000 to 11,200 feet: Sierra Nevada from Tulare Co. to Nevada Co.; Mt. Shasta; mountains of western Siskiyou Co. July-Sept.

Locs.—Giant Forest, Tulare Co., *K. Brandegee;* Kearsarge Pinnacles, Bullfrog Lake, *Jepson* 848; Tamarack Mdw. near Dinkey Big Trees, *A. L. Grant* 1192; Lake of the Lone Indian, Fresno Co., *A. L. Grant* 1549; Mt. Lyell, *Jepson* 3326; Benson Lake, Tuolumne Co., *Jepson* 4506; Echo Ridge, near Echo Lake, Eldorado Co., *Ottley* 1173; Bierstadt Peak, Nevada Co., *Davy* 3188; Mt. Shasta (Erythea 4:139); Marble Valley, Siskiyou Co., *Butler* 12.

Refs.—SAXIFRAGA BRYOPHORA Gray, Proc. Am. Acad. 6:533 (1865), type loc. Ebbetts Pass, Alpine Co., 9000 ft.; Jepson, Fl. W. Mid. Cal. 269 (1901), ed. 2, 198 (1911), Man. 456, fig. 447 (1925). *Spatularia bryophora* Small, N. Am. Fl. 22:148 (1905).

12. **S. tolmiei** T. & G. ALPINE SAXIFRAGE. Plants 2 to 5 inches high, the stems leafy, diffusely branching, forming dense tufts; leaf-blades linear, closely imbricated on the short branches, sessile, 3 to 5 lines long; cymes disposed in a corymbose panicle or close cluster; filaments dilated at the summit.

High montane rocky slopes, 8500 to 10,000 feet: Sierra Nevada from Tulare Co. to Tehama Co. and Mt. Shasta. North to British Columbia and southern Alaska. July.

The Californian representation of this species was long ago set off by Greene as distinct under the name Saxifraga ledifolia. As var. ledifolia it was later characterized by Engler and Irmscher as more robust than typical Washington plants of S. tolmiei and as possessing linear-oblong leaves. While Californian plants are sometimes a little stouter, plants from Mt. Silliman are as slender as plants from Mt. Adams, Wash. (*Suksdorf* 489) and are like them in leaf shape and size. Nor, indeed, does other California material differ in any essential way from plants inhabiting more northerly stations. Our specimens represent a graduated series extending from California to Alaska with only a certain degree of apparently ecological variation.

Locs.—Mt. Silliman, *K. Brandegee;* Kaiser Peak, *Jepson* 13,032; Silver Pass, Fresno Co., *A. L. Grant* 1543; Tinkers Knob, Placer Co., *Sonne* 92; Lassen Peak, *Jepson* 15,325; Mt. Shasta (Erythea 4:139).

Refs.—SAXIFRAGA TOLMIEI T. & G. Fl. 1:567 (1840), type loc. "Northwest Coast", *Tolmie;* Jepson, Fl. W. Mid. Cal. 269 (1901), ed. 2, 198 (1911), Man. 457, fig. 448 (1925). *S. ledifolia* Greene, Pitt. 2:101 (1890), type loc. mts. above Truckee, *C. F. Sonne. Leptasea ledifolia* Small, N. Am. Fl. 22:155 (1905). *S. tolmiei* var. *ledifolia* Engler & Irm.; Engler, Pflzr. 4^{117}:88 (1916).

SAXIFRAGA SARMENTOSA L. f. Supplem. 240 (1781), type from Japan. Herbage and inflorescence pilose; leaf-blades orbicular, crenate, white-veined above, reddish beneath; corolla white, pink-tinted, very irregular; petals shortly clawed, the 3 upper ovate, about ⅓ as long as the 2 lower ovate-lanceolate ones.—Garden plant from Asia, sparingly colonized in the Redwoods near Sebastopol, Sonoma Co. It spreads by slender runners.

2. SAXIFRAGOPSIS J. K. Small

Perennial herb with somewhat scape-like flowering stems and tufts of basal leaves arising from scaly winter-buds terminating the branches of the woody root-crown. Root-crown densely clothed with old persistent petioles and scales. Leaves unifoliolately compound, the blades cuneate-obovate, dentate above the middle, entire on the sides, jointed at base to the petiole. Flowers small, in a narrow panicle. Calyx-lobes finally reflexed. Petals white, obovate, gradually narrowed to a short claw, at length reflexed. Filaments subulate. Ovary adnate to the calyx-tube at base, its carpels united to the middle or above, erect in fruit.—Species 1. (Saxifraga and Greek opsis, resemblance.)

1. **S. fragarioides** Small. Stems 4 to 8 inches high; herbage glandular-pubescent; leaf-blades ½ to 1½ inches long, disjointing roughly from the petiole in age; petals 1 line long.

Montane, on cliffs or rocky slopes, 5500 to 6500 feet: Salmon Mts.; Scott Mts.; Marble Mt. North to southwestern Oregon. July.

Locs.—Twin Lakes to Thompson Peak, Salmon Mts., *Alexander & Kellogg* 229; Highland Mine, Siskiyou Co., *Butler* 897; Marble Mt., Siskiyou Co., *Jepson* 2833.

Refs.—SAXIFRAGOPSIS FRAGARIOIDES Small, Bull. Torr. Club 23:20 (1896). *Saxifraga fragarioides* Greene, Bull. Torr. Club 8:121 (1881), type loc. Castle Lake, Scott Mts., *Pringle;* Jepson, Man. 456 (1925).

3. JEPSONIA J. K. Small

Perennial herbs with basal leaves and scapes from corm-like roots. Flowers few in a cyme terminating a naked scape, appearing in the autumn before the leaves. Leaf-blades round-cordate, crenate and shallowly crenate-lobed. Calyx 5-toothed, its tube short-cylindric, the base with a honey-bearing area within.

Petals inserted by short claws nearly in the sinuses, rotately spreading. Stamens 10, those opposite the sepals dehiscing their pollen very early. Carpels free from the calyx, united, their styles bearing kidney-shaped stigmas.—Species 1, California. (Willis Linn Jepson, author of a Flora of California.)

1. **J. parryi** Small. Scapes 3 to 10 inches high; leaf-blades when mature ¾ to 2 inches wide, on petioles (1½ or) 3 to 4 inches long; flowers 2¼ lines long; calyx with 10 purple nerves, the alternate ones forking at the sinuses, a branch proceeding to the apex of each adjacent lobe; petals ovatish, white, purple-nerved beneath, 1½ to 2½ lines long; ovary with fine brownish nerves.

Moist places in the dry hills or on shelving rocky cliffs, 100 to 1500 feet: San Diego to San Jacinto Valley; east base of Mt. San Jacinto; Santa Catalina, Santa Cruz and Santa Rosa islands; Sierra Nevada foothills from Mariposa Co. to Tuolumne Co. Also on Guadalupe Island. Flowering in Nov. and Dec. after the fall rains begin.

Habitat note.—This species is very common between National City and Dulzura, San Diego Co. The plants inhabit bare places on moist slopes, the leaves lying flat on the ground and, in aspect, recalling somewhat little maple leaves. The tubers are abundant and easily collected. Children gather them to eat and call them "coconuts." "In time," says C. N. Forbes, one of our students, "they become deep-seated, as much as six to eight inches, since the new tuber each year is formed immediately below the old one." At the east base of Mt. San Jacinto, F. W. Peirson notes the occurrence of plants under the edges of rocks along small water courses at about 2000 feet, and also in the bottom of Andreas Cañon at about 1000 feet.

Note on variation.—The inflorescence is usually a little loose in Southern California specimens, the calyx commonly cylindric and a little truncatish at base. In insular plants (the form J. malvaefolia Small), which have close flower clusters, the calyx is somewhat bowl-shaped, short, 1½ to 2 lines long (Santa Rosa Isl., *Trask;* San Clemente Isl., *Purpus*). This condition is, however, repeated in the mainland National City (Forbes) specimens (J. parryi Small) which have similar short calyces and, in some cases, congested flower clusters. In one collection from Italian Bar, Tuolumne Co. (*A. L. Grant*), representing the form J. heterandra Eastw., we find both campanulate calyces and cylindric calyces with truncatish base, depending upon the age of the flowers. In these Tuolumne Co. specimens, further, the leaf-blades are often but not always cordate, frequently not "overlapping"; they may be as much as 3¼ inches wide (Columbia, *A. L. Grant* 605). The described differences of the various forms, in short, are not geographically consistent as implied; they are too slight to be significant. The plants of the three regions, Southern California, the Santa Barbara Islands and the central Sierra Nevada foothills are, indeed, extremely alike in habit, leafage, pubescence, and flowers; specimens could not be dissociated if mixed.

Locs.—Fallbrook, San Diego Co., *Parish* 2771; Arch Beach, Orange Co., acc. *Peirson;* Santa Ana Mts. near Elsinore., acc. *Peirson;* Santa Ana Cañon, Santa Ana Mts. (Bull. Torr. Club 49:36); Winchester, Riverside Co.; Mt. San Jacinto, e. base (Muhl. 3:123); Valdez Harbor, Santa Cruz Isl., *Ralph Hoffmann;* Columbia, *A. L. Grant* 605; Italian Bar, South Fork Stanislaus River, *A. L. Grant.*

Refs.—JEPSONIA PARRYI Small, Bull. Torr. Club, 23:18 (1896); Jepson, Man. 457 (1925). *Saxifraga parryi* Torr. Bot. Mex. Bound. 69 (1859), type loc. dry hillsides near San Diego, *Bigelow. J. malvaefolia* Small, l.c. 23:19 (1896). *Saxifraga malvaefolia* Greene, Bull. Torr. Club 9:121 (1882), type loc. Santa Rosa Isl., *Kellogg* (cf. Cal. Acad. hb.). *Jepsonia heterandra* Eastw. Bull. Torr. Club 32:201 (1905), type loc. Mariposa Co., *Congdon. J. parryi* var. *heterandra* Jepson, Man. 457, fig. 449, (1925). *J. neonuttalliana* Millsp. Field Mus. Nat. Hist. Bot. 5:124 (1923), type loc. near Lookout Point, Santa Catalina Isl., *L. W. Nuttall* 931.

4. PELTIPHYLLUM Engler

Coarse herb, the leaves all basal, the scapes naked, arising from thick fleshy horizontal rootstocks, surpassing the leaves. Leaf-blades orbicular-peltate, cupped at center, elevated on long petioles with membranous dilations at base resembling stipules. Flowers appearing before the leaves, white, in terminal simple or paniculately compound cymes. Calyx-tube joined to lower part of the pistils, the lobes reflexed in age. Stamens 10. Pistils 2, almost distinct. Follicles almost, but not quite, distinct, turgid, spreading.—Species 1. (Greek pelti, peltate, and phullon, leaf.)

1. **P. peltatum** Engler. Umbrella Plant. Stout plant 1 to 4 feet high; leaf-blades 1 to 2 feet broad, 9 to 15-lobed, irregularly serrate, the petioles 1 to 3½ feet high; flowers 6 to 7 lines broad.

Banks of rapid mountain streams, 1400 to 5600 feet: Sierra Nevada from Fresno Co. to Siskiyou Co., thence south in the Coast Ranges to Humboldt Co. North to central Oregon. June-July.

Field note.—This species, the Indian Rhubarb of the pioneers, was first discovered by the members of the Wilkes Expedition on the upper Sacramento River where it forms a fringe along the water's edge from Horseshoe Bend down stream to Lemoine, after which it is frequent as far as Pitt sta. or a few miles below. While a very remarkable plant, the genus Peltiphyllum on the basis of its flower is scarcely separable from Saxifraga. The carpels are only slightly united to the calyx and are not "halb unterständig" as described by Engler.

An interesting feature of the life history of the plant is to be noted: the leaves of seedlings are orbicular-cordate and not peltate. Sometimes the earliest leaves of the season, arising from rootstocks, are likewise not at all peltate. Yet again early leaves from the rootstock may be peltate with a cleft on the lower side extending half-way to the petiole, thus exhibiting intergrade states to the adult type of leaf.

The stout fleshy petioles and scapes, with the epidermis peeled, were eaten by the native tribes and, when young, regarded as a delicacy. In our journeys we have tried them and found them pleasant. The great leaves were also used by the Indians as folders in which to wrap newly-caught fish.

Introduced into Europe in 1872 by the collector, Benito Roezl, it is now widely cultivated in botanic gardens. Cf. Gartenflora 21:259, t. 735 (1872).

Locs.—Coast Ranges: headwaters of Mattole River, *Jepson;* North Fork of Middle Eel River, opposite Red Rock, *Jepson;* Berry ranch, Redwood Creek, *Jepson* 1958; Grouse Mt., *Tracy* 4934; Martin Ranch, South Fork Trinity River, *Jepson;* Noble Ranch, New River, *Jepson;* Forks of Salmon to Cecilville, *Jepson;* Salmon road crossing, Etna Creek, Siskiyou Co., *Butler* 220. Sierra Nevada: Sequoia Lake near Millwood, *H. P. Kelley;* Pine Ridge, Fresno Co., *Hall & Chandler;* Lily Creek, Yosemite, *Jepson* 10,446; Hazel Green, *Jepson* 13,465; Towle, Placer Co., *Sonne;* Harts Mill, Butte Co., *Jepson;* Rich Point, Plumas Co., *Jepson;* Colby, Butte Co., *R. M. Austin;* Squaw Creek, McCloud River, *Platt;* Castle Rock sta., Sacramento River, *Jepson;* Horseshoe Bend, Sacramento River, *Jepson.* Oregon: East Fork Illinois River, *Jepson;* Tamba Ranch, Chetco River, *Jepson.*

Refs.—Peltiphyllum peltatum Engler; Engler & Prantl, Nat. Pflzf. 3^{2a}:61 (1891); Jepson, Man. 457 (1925). *Saxifraga peltata* Torr.; Benth. Pl. Hartw. 311 (1849), type loc. Pine Creek, Sierra Nevada foothills, Butte Co., *Hartweg* 246; Torr. Phanerogamia of the Pacific Coast, Wilkes Exped. 309, pl. 5 (1874); Jepson, Erythea 5:55 (1897), Fl. W. Mid. Cal. 269 (1901), ed. 2, 198 (1911); Hook. f. Bot. Mag. t. 6074 (1874). *Leptarrhena inundata* Behr, Proc. Cal. Acad. 1:45, 57 (1855), type loc. *Placerville.*

5. BOYKINIA Nutt.

Perennial herbs with creeping rootstocks. Stems simple, bearing a few alternate leaves and paniculate or corymbose cymes of white flowers. Stipules present or none. Calyx-tube turbinate or subglobose or ovate, ½ to ¾ adherent to the 2-celled ovary. Petals elliptic to linear, entire, with a short claw, deciduous. Stamens 5, short. Styles 2. Capsule 2-beaked. Species 9, North America. (Dr. Boykin of Georgia.)

Flowers secund; corolla slightly irregular; petals narrow, obtuse at apex; ovary half inferior.—Subgenus Therofon.
    Petals cuneate-oblong or obovate, 1½ to 2 lines long, 2 to 3 times as long as the calyx-lobes; leaves with stipules.......1. *B. elata.*
    Petals linear-spatulate, 1 line long, little longer than the calyx-lobes; leaves without stipules. 2. *B. rotundifolia.*
Flowers in terminal corymbose cymes; corolla regular; petals broad; ovary almost wholly inferior.—Subgenus Hemieva.
    Rootstock or caudex stout, vertical, not bulblet-bearing; leaves incised; stipules foliaceous, conspicuous.......3. *B. major.*
    Rootstock very short, vertical, crowded with bulblets; leaves with 3 nearly distinct leaflets; stipules none.......4. *B. ranunculifolia.*

1. **B. elata** Greene. Brook Foam. Stem slender, erect, 1¼ to 2 feet high; herbage nearly glabrous or obscurely or thinly hairy, the structures at base rusty-

hairy; leaves thin-membranous, shallowly lobed or incised, serrate, 1 to 4 inches broad; petioles long, dilated at base and bearing stipule-like bristles or subulate lobes; flowers slightly irregular, borne in a panicle of secund racemes; lower portion of calyx-tube glandular-hairy, upper portion nerved or somewhat ridged; calyx in age urn-shaped; calyx-lobes lanceolate-triangular; petals obovate to oblanceolate, obtuse.

Along wooded streams, often close to the water: near the coast, 50 to 2000 feet, Santa Monica Mts. to Humboldt Co.; Sierra Nevada, 2000 to 4500 feet, from Amador Co. to Sierra Co. North to Washington. June-July.

Locs.—S. Cal.: Topango Cañon, Santa Monica Mts., *Barber;* Santa Inez Mts., *G. W. Dunn.* Coast Ranges: Lucia, Monterey Co., *Jepson* 1670; Arroyo Seco, Santa Lucia Mts., *J. T. Howell* 3014; Soquel Creek, Santa Cruz Mts., *Jepson* 13,454; Inverness, *Jepson* 557b; Ft. Bragg, *W. C. Mathews* 88; Mt. St. Helena, *Alice King;* betw. Cahto and Westport, *Jepson* 13,452; Carlotta, Humboldt Co., *M. S. Baker* 84b; Martin Ranch, South Fork Trinity River, *Jepson* 2012; Sommes Bar, Klamath River, *Chandler* 1501. Sierra Nevada: New York Falls, Amador Co., *Hansen* 293; Bear Valley, Nevada Co., *Jepson* 13,455; Bowman Lake, Nevada Co., *A. M. Carpenter;* near Weeds Point, Nevada Co., *Jepson* 16,772.

Refs.—BOYKINIA ELATA Greene, Fl. Fr. 190 (1891); Jepson, Fl. W. Mid. Cal. 269 (1901), ed. 2, 198 (1911), Man. 458, fig. 451 (1925). *Saxifraga elata* Nutt.; T. & G. Fl. 1:575 (1840), type loc. Chinook Pt., lower Columbia River, *Nuttall. Therofon elatum* Greene, Man. Reg. S. F. Bay 121 (1894). *B. occidentalis* T. & G. Fl. 1:577 (1840), type from Oregon, *Douglas. Therophon cincinnatum* Ros. & Ryd. N. Am. Fl. 22:124 (1905), type loc. Santa Cruz, *Pringle. B. occidentalis* var. *cincinnata* Ros.; Engler, Bot. Jahrb. 37^2:beibl. 61 (1906).

2. **B. rotundifolia** Parry. (Fig. 149.) Stems slender, 1 to 2 feet high; stems and petioles glandular-hirsute and viscid; leaf-blades round-cordate, very shallowly lobed, denticulate, 2 to 7 inches broad; petioles bristly at base, the bristles sometimes pinnately branched; calyx 10-nerved, hirsutulous, more or less glandular; petals obovate, little surpassing the calyx-lobes.

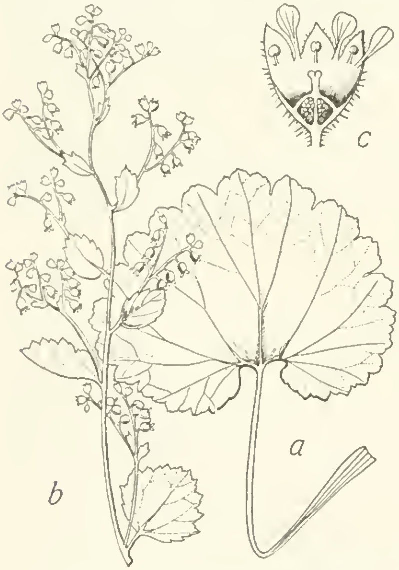

Fig. 149. BOYKINIA ROTUNDIFOLIA Parry. *a*, basal leaf, × ¼; *b*, infl., × ¼; *c*, fl., × 3.

Borders of montane streams, 2500 to 6500 feet: south slopes of the San Gabriel Mts. and San Bernardino Mts.; north slope of the San Jacinto Mts. July.

Locs.—San Gabriel Mts. near Glendora, *Braunton* 767; Mt. Wilson, *Geo. B. Grant* 1289; Waterman Cañon, San Bernardino Mts., *Parish* 7147; Mill Creek, San Bernardino Mts.; Snow Creek, San Jacinto Mts., *Clary* 1640.

Refs.—BOYKINIA ROTUNDIFOLIA Parry; Gray, Proc. Am. Acad. 13:371 (1878), type loc. Waterman Cañon, San Bernardino Mts., *Parry & Lemmon* 113; Jepson, Man. 458 (1925). *Therofon rotundifolium* Wheelock, Bull. Torr. Club 23:70 (1896).

3. **B. major** Gray. Stem coarse and stout, 2 to 3 feet high; herbage somewhat glandular-scabrous; leaf-blades roundish-cordate, 4 to 8 inches broad, 5 to 9-cleft, the divisions coarsely incised and toothed; lowest stipules membranous, the upper foliaceous, partly clasping the stem, often unequal in size and unlike in shape, 5 to 20 lines broad, those at the middle of the stem broadest; calyx-tube at first hemispherical, soon subglobose or urn-shaped, the lobes triangular, acute; petals obovate or roundish-ovate, 2½ lines long.

Wet meadows in woods or by wooded banks of streams, 3000 to 5700 feet: Sierra Nevada from Madera Co. to Butte Co.; Humboldt Co. to Siskiyou Co. North to Washington and Montana. July 15-Aug.

Locs.—Sierra Nevada: Fresno Big Trees, *Jepson* 15,971; Crane Creek, Mariposa Co., *Jepson* 4647; Snowdon Ranch, near Calaveras Big Trees, *Jepson* 13,458; Dogwood Creek, Middle Fork Feather River, *Jepson* 10,619. North Coast Ranges: South Fork Mt., *Tracy* 8935; North Fork Coffee Creek, Trinity Co., *Alexander & Kellogg* 221; Salmon Mt., *Butler* 217. Ore.: Ashland Butte, *Jepson* 2574.

Refs.—Boykinia major Gray, Bot. Cal. 1:196 (1876), type loc. Mariposa Co., *Bridges, Brewer, Bolander;* Jepson, Fl. W. Mid. Cal. 269 (1901), ed. 2, 198 (1911), Man. 459, fig. 452 (1925). *Therofon majus* Wheelock, Bull. Torr. Club 23:70 (1896).

4. **B. ranunculifolia** Greene. Stem 3 to 8 inches high; leaves with 3 almost distinct leaflets; leaflets broader than long or somewhat fan-shaped, mostly 3-lobed at apex, often with 1 or 2 supplementary lobes or teeth, 3 to 8 lines broad; flowers 3 lines long, in a compact or open cyme; petals elliptic-obovate, obtusish.

Montane, 5000 to 6000 feet: Plumas Co. North to British Columbia.

Locs.—Spanish Peak (Bot. Cal. 2:445); Siskiyou Mts., s. Ore., *Howell.*

Refs.—Boykinia ranunculifolia Greene, Fl. Fr. 190 (1891); Jepson, Man. 459 (1925). *Saxifraga ranunculifolia* Hook. Fl. Bor. Am. 1:246, t. 83 (1834), type loc. Kettle Falls, Columbia River, *Douglas. Suksdorfia ranunculifolia* Engler; Engler & Prantl, Nat. Pflzf. 3^{2a}:52 (1891).

6. **BOLANDRA** Gray

Perennial herbs with bulblet-bearing rootstocks and leafy stems. Leaves thin, palmately-veined. Flowers loosely paniculate. Calyx cup-shaped. Petals greenish with purple border, narrowly lanceolate-attenuate. Styles 2. Ovary wholly free from the calyx, its 2 carpels lightly joined.—Species 2, California, Oregon and Washington. (Dr. H. N. Bolander, botanist of the California Geological Survey from 1865 to 1870.)

1. **B. californica** Gray. Stems slender, 6 to 9 inches high, puberulent, the leaves glabrous; leaf-blades round-cordate, ½ to 1¾ inches broad, 5-cleft, the segments rounded and shallowly lobed or toothed; petioles 2 to 4 inches long; upper cauline leaves reduced, ovate, toothed, sessile; flowers 3 lines long; calyx-lobes and petals recurving.

Montane, wet rocks, 5000 to 8400 feet: central Sierra Nevada from Mariposa Co. to Eldorado Co. May-July.

Habitat note.—In our experience this interesting saxifrage is somewhat rare in individuals. Always found in granite country, it grows like a fern under the edge of boulders, or on dripping moss-covered rocks, or in rock crevices in moist situations, and may well be a glacial relic.

Locs.—Silver Apron, below Nevada Fall, *Jepson* 10,460; Lake Eleanor, *A. L. Grant* 1263; Stubblefield Cañon, Tuolumne Co., *Jepson* 4569; Modjeska Falls, Glen Alpine, Eldorado Co., *Reed & Pendleton* 1677.

Refs.—Bolandra californica Gray, Proc. Am. Acad. 7:341 (1868), type loc. Yosemite Valley on the Mariposa trail, *Bolander;* Jepson, Man. 459, fig. 453 (1925).

7. **TIARELLA** L. False Mitre-wort

Perennial herbs with white flowers in a terminal raceme or panicle. Calyx adherent only to very base of ovary, its lobes ovate. Petals linear-subulate with short claws, inconspicuous. Stamens 10, long and slender. Ovary 1-celled, compressed, 2-horned, the horns tapering into the long filiform styles. Capsule membranous, early dehiscent; valves unequal, one becoming elongated, the other remaining short. Seeds few at the base of each parietal placenta.—Species 5, North America and Asia. (Diminutive of Greek tiara, a high cap, in allusion to the pistil.)

1. **T. unifoliata** Hook. Sugar-scoop. Stems several, sparingly leafy, ¾ to 2 feet high; leaf-blades roundish or ovate, 3 to 5-lobed, cordate at base, 1 to 4 inches broad, the lobes crenate; cauline leaves 2 or 3; basal leaves long-petioled (3 to 9 inches); panicle 3 to 9 inches long; calyx-lobes minutely ciliolate.

Shady cañons and woods near the coast, 200 to 2000 feet: Santa Cruz Mts. to Humboldt Co. North to Montana and Alaska. May-July.

Locs.—Soquel Creek, Santa Cruz Mts., *Jepson* 13,462; Cahto, Mendocino Co., *Jepson* 13,464; Pepperwood, lower Eel River, *Jepson* 1914; Bull Creek, near Dyerville, *Jepson* 12,359; Carlotta, Humboldt Co., *M. S. Baker* 82c; Arcata, *Chesnut & Drew*. Ore.: Ashland Butte, *Jepson* 2571.

Refs.—TIARELLA UNIFOLIATA Hook. Fl. Bor. Am. 1:238, t. 81 (1834), type loc. headwaters of the Columbia River, Rocky Mts., *Drummond;* Jepson, Fl. W. Mid. Cal. 270 (1901), ed. 2, 200 (1911), Man. 460 (1925). *Heuchera longipetala* Moc. & Ses. Calq. des Dessins, t. 423 (1874). *T. unifoliata* var. *procera* Gray, Bot. Cal. 1:199 (1876). *Heuchera californica* Kell. Proc. Cal. Acad. 5:53 (1873), type loc. San Gregorio Creek, San Mateo Co., *Kellogg & Brannan,* is thought to belong here (Bull. Cal. Acad. 1:136). *T. californica* Rydb. N. Am. Fl. 22:118 (1905).

8. LITHOPHRAGMA Nutt.

Perennial herbs, the rootstocks tuberous or with grain-like bulblets. Stems simple, bearing a simple terminal raceme of several white or pink flowers. Leaves chiefly basal, their petioles with stipule-like dilations at the base. Calyx-tube adherent to the base or lower half of the ovary. Petals inserted in the sinuses of the calyx, cleft or toothed or entire, usually a little unequal. Stamens 10, included. Ovary 1-celled, with 3 parietal placentae and 3 very short styles. Capsule conical. Seeds numerous.—Species 7, western North America. (Greek lithos, rock, and phragma, fence, referring to the habitat.)

Bibliog.—Gray, A., [Revision of] Lithophragma (Proc. Am. Acad. 6:533–535,—1865). Greene, E. L., The genus Lithophragma (Erythea 3:102–103,—1895).

Basal leaves crenate or shallowly lobed; petals white, entire or toothed; mostly cismontane.
Calyx-tube turbinate; petals mostly 3-toothed at apex, the central tooth rather larger; ovary half free from the calyx........1. *L. affinis.*
Calyx-tube shortly campanulate, broad.
Calyx-tube acutish at base; petals entire; ovary half-free from calyx....2. *L. cymbalaria.*
Calyx-tube rounded or truncate at base; petals toothed or entire; ovary almost wholly free from calyx.
Base of petal blade not involute, not toothed........3. *L. heterophylla.*
Base of petal blade somewhat involute, minutely toothed or laciniate..4. *L. scabrella.*
Basal leaves twice palmately parted or divided; petals pink or pinkish, rarely white, palmately or pinnately 3 to 5 (or 7)-cleft or -parted; transmontane, or in ranges bordering the desert or the Great Basin.
Stems with black bulbils crowded in the axils........5. *L. glabra.*
Stems not bulbiferous.
Calyx broadly campanulate, acute at base........6. *L. tenella.*
Calyx broadly clavate........7. *L. parviflora.*

1. **L. affinis** Gray. WOODLAND STAR. Stems 9 to 16 inches high, hispidulous, the hairs spreading and glandular; basal leaves often bronze-brown, the blades roundish in outline and crenately lobed, varying into the cauline; blades of the cauline leaves mostly parted into 3 broad divisions which are deeply incised or merely toothed; pedicels about equaling the turbinate calyx; raceme 7 to 10-flowered.

Open ground or open woods of the foothills and valleys, 150 to 2000 feet: coastal Southern California; Coast Ranges; Great Valley. Mar.-May.

Locs.—Coast Ranges: Mesa Grande, San Diego Co., *E. Ferguson* 309; Paso Robles, *Benj. Cobb;* Corral Hollow, Mt. Hamilton Range, *Jepson* 9571; Mt. Tamalpais, *Chesnut & Drew;* Calistoga, *Jepson* 4029; Salt Gulch, Greasewood Hills, w. Tehama Co., *Jepson* 13,466; Klamath Hills, near Yreka, *Butler* 687. Sierra Nevada: Vernal Fall, Yosemite, *Jepson* 10,457; Curtin Mdws., below Tuolumne Big Trees, *Jepson* 10,534; Phoenix Lake, Sonora, *A. L. Grant* 663; Kyburg, Eldorado Co., *Francis Ramaley* 11,271. Sacramento Valley: Little Oak, nw. Solano Co., *Jepson* 13,468; South Peak, Marysville Buttes, *Jepson* 13,469. Like L. heterophylla T. & G., L. affinis Gray is a variable species. Towards the margin of its range, as in Southern California and in the Sierra Nevada foothills, it tends to intergrade to L. heterophylla.

Refs.—LITHOPHRAGMA AFFINIS Gray, Proc. Am. Acad. 6:534 (1865), type loc. near San Francisco, *Brewer;* Jepson, Man. 460 (1925). *Tellima affinis* Bol. Cat. Pl. S. F. 11 (1870); Gray, Bot. Cal. 1:198 (1876), Jepson, Fl. W. Mid. Cal. 270 (1901), ed. 2, 199 (1911). *L. trifida*

Eastw.; N. Am. Fl. 22:89 (1905), type loc. Sweetwater Dam, San Diego Co., *Eastwood*. *Tellima trifida* Fedde, Just Bot. Jahresb. 33^1:614 (1906). *L. intermedia* Rydb. N. Am. Fl. 22:88 (1905), type loc. Los Angeles Co., *H. E. Hasse*, and *L. catalinae* Rydb. l.c., type loc. Avalon, Santa Catalina Isl., *Blanche Trask*, probably belong here. *Tellima intermedia* and *T. catalinae* Fedde, Just Bot. Jahresb. 33^1:614 (1906).

2. **L. cymbalaria** T. & G. Mission Star. Stems filiform, 10 to 17 inches high; blades of basal leaves round-reniform, 3 to 5-lobed, 2 to 9 lines broad; cauline leaves mostly only a pair, these opposite or nearly so; flowers few, the slender pedicels exceeding the calyx; calyx broadly campanulate, often with an obscure brownish or constricted band below the lobes; petals elliptic, entire or nearly so.

Hills, mostly near the coast, 500 to 1500 feet: San Luis Obispo Co. to San Diego Co. Mar.-Apr.

Locs.—Paso Robles, *Benj. Cobb;* San Luis Obispo, *Summers;* Arroyo Grande, *Alice King;* Rattlesnake Cañon, Santa Inez Mts., *Jepson* 9125; Santa Cruz Isl., *T. Brandegee;* Oak Grove trail to Palomar Mt., *Munz* 10,402.

Refs.—LITHOPHRAGMA CYMBALARIA T. & G. Fl. 1:585 (1840), type loc. Santa Barbara, *Nuttall;* Jepson, Man. 460 (1925). *Tellima cymbalaria* Steud. Nom. Bot. ed. 2, 2:665 (1841).

3. **L. heterophylla** T. & G. Hill Star. Stems 1 to 2 feet high; herbage hirsutulose or somewhat scabrous-pubescent, sometimes glandular at base; leaf-blades roundish, crenately lobed, ½ to 1¼ inches broad, the cauline very variable but mostly 3-parted with the divisions incised or toothed; pedicels mostly shorter than the calyx, often very short; calyx campanulate, truncate or rounded at base, sparingly puberulent; petals with 1 or 2 teeth on each side, sometimes with 3 or 4.

Shady ground in the hills, 300 to 3000 feet: coastal Southern California; Coast Ranges; Great Valley; lower Sierra Nevada foothills. Mar.-June.

Locs.—No two stations of Lithophragma heterophylla show quite similar individuals. It is an especially variable form in leaf outline and segmentation, especially in the case of the cauline leaves. The petals vary in size and in toothing; while they are usually cleft, toothed and entire petals may be found in the same flower. In most cases the petals are a little ascending, while in the case of the var. scabrella they are often nearly erect. In L. tenella and in L. affinis, on the other hand, the petals are commonly rotate. We include the following under L. heterophylla. S. Cal.: Escondido, *C. V. Meyer* 14; Santa Ana Mts., *Alice King;* Millard Cañon, San Gabriel Mts., *Peirson* 69; Cañon Diablo, San Bernardino Mts., *Parish*. Tehachapi Mts.: Rowen, *Jepson* 6727. Coast Ranges: Alum Rock Cañon, San Jose, *Pendleton* 680; Berkeley, *Jepson* 13,471; Mt. Tamalpais, *Chesnut;* St. Helena, *Jepson* 13,470; Calistoga, *Jepson* 4018. Great Valley: Smith Mt., ne. of Dinuba, *Harriet Kelley;* South Peak, Marysville Buttes, *Jepson* 13,475; Crane Creek, w. Tehama Co., *Jepson* 13,472. Sierra Nevada foothills: Murphy, *Davy* 1523; Sheep Ranch, Calaveras Co., *Davy* 1589; Placerville, *K. Brandegee*.

Refs.—LITHOPHRAGMA HETEROPHYLLA T. & G. Fl. 1:584 (1840); Jepson, Man. 460 (1925). *Tellima heterophylla* H. & A. Bot. Beech. 346 (1840), type from Cal. *Douglas;* Jepson, Fl. W. Mid. Cal. 270 (1901), ed. 2, 199 (1911). *L. bolanderi* Gray, Proc. Am. Acad. 6:535 (1865), type loc. shady ravine se. of Mt. Diablo, *Brewer*. *Tellima bolanderi* Bol. Cat. Pl. S. F. 11 (1870). *T. heterophylla* var. *bolanderi* Jepson, Fl. W. Mid. Cal. 270 (1901). *L. heterophylla* var. *bolanderi* Jepson, Man. 460 (1925). *L. triloba* Rydb. N. Am. Fl. 22:87 (1905), type loc. Santa Lucia Mts., *R. A. Plaskett*. *Tellima triloba* Fedde, Just Bot. Jahresb. 33^1:614 (1906).

4. **L. scabrella** Greene. Sierra Star. Plants 9 to 21 inches high; stems hispidulose with short spreading hairs, on upper part with the hairs sometimes gland-tipped; leaf-blades crenate and crenately lobed, 5 to 14 inches wide, the cauline few, often 3-cleft or -divided; calyx bowl-shaped, borne on a pedicel ⅙ to 1 line long; petals spreading, elliptic-ovate to oblong, entire or more commonly with 1 or 2 (to 4) teeth on each side; claws very slender, exserted, rather abruptly joined to the somewhat truncatish or very obtuse base of the limb which is somewhat folded and minutely crenulate or minutely laciniate on its margins.

Wooded slopes, 1700 to 8500 feet: Siskiyou Co.; Sierra Nevada from Tehama Co. to Kern Co. May-July.

Locs.—In character of pubescence L. scabrella does not differ from some states of genuine L. heterophylla T. & G. All the specimens here cited have in common, however, the peculiarity of closely set and very fine teeth at the base of the petal-blade. Just at this point, too, the widening summit of the claw is commonly somewhat folded. Siskiyou Co.: Marble Mt., *Jepson* 2825. Sierra Nevada: Mineral, Tehama Co., *Jepson* 12,276; Rough and Ready, Nevada Co., *Jepson* 13,474; Italian Bar, South Fork Stanislaus River, *A. L. Grant* 23; Columbia, Tuolumne Co., *Jepson* 6337; McClure Fork Merced River, *Jepson* 3215; Cedar Brook, near Fresno Flats, *Newlon* 169a; Limekiln Creek, Tulare Co., *Jepson* 2793.

Var. peirsonii Jepson var. n. Leaves mainly cauline, the lower as well as the upper usually bearing red bulbils in their axils; leaf-blades trefoil-shaped, 3 to 12 lines wide, the lobes entire or more commonly with 1 to 3 notches; some of the racemes with the flowers replaced by bulbils.—(Folia plerumque caulina, et inferiora et superiora in axillaribus bulbulos rubros ferentia; folia trifoliata, lin. 3–12 lata, lobis integerrimis vel saepius 1–3 serratis; aliquot racemi floribus bulbulis substitutis.)—Shady places, 3750 to 5000 feet: Liebre Mts., western Mohave Desert (Collins Ranch, *F. W. Peirson* 3079, type). June.

Refs.—LITHOPHRAGMA SCABRELLA Greene, Erythea 3: 102 (1895). *Tellima scabrella* Greene, Pitt. 2:162 (1891), type loc. pine wood s. of Tehachapi town, *Greene*. *L. heterophylla* var. *scabrella* Jepson, Man. 460 (1925). *L. laciniata* Eastw.; Small & Rydb. N. Am Fl. 22:87 (1905), type loc. Marysville Buttes, *Blankinship*, apparently belongs here. *Tellima laciniata* Fedde, Just Bot. Jahresb. 33^1:614 (1906). Var. PEIRSONII Jepson.

5. **L. glabra** Nutt. var. **bulbifera** Jepson comb. n. ROCK STAR. Similar in habit to L. tenella; stems glandular-puberulent; cauline leaves 2 or 3, remote, usually smaller than the basal; leaf-blades 2 to 5 (or 10) lines wide, twice palmately divided into oblong segments ½ to 1 line long; axils of the stem leaves and bracts of the inflorescence more or less crowded with minute dark purple or black subglobose or oblong pubescent bulbils; flowers small; calyx hispidulose, broadly campanulate, with a very short broadly cuneate base, 1 to 1½ lines long; petals white or pinkish, pinnately or palmately laciniate, 1¼ to 2 lines long.

Damp soil in shade of rocks, 5000 to 8000 feet: Eldorado Co. to Modoc Co.; Siskiyou Co. to northern Humboldt Co. North to British Columbia, east to Colorado. May-July.

Locs.—Mt. Tallac, Eldorado Co.; Truckee, e. Nevada Co., *Sonne;* Ft. Bidwell, *Manning* 101; Goose Lake Valley, Modoc Co., *R. M. Austin;* Yreka, *Butler* 1132; Salmon Mts., Trinity Co.; Trinity Summit, Humboldt Co., *Davy* 5795.

Refs.—LITHOPHRAGMA GLABRA Nutt.; T. & G. Fl. 1:584 (1840), type loc. Blue Mts., ne. Oregon, *Nuttall*. Var. BULBIFERA Jepson. *L. bulbifera* Rydb. N. Am. Fl. 22:86 (1905), type loc. Battle, Carbon Co., Mont., *F. Tweedy* 4411. *Tellima bulbifera* Fedde, Just Bot. Jahresb. 33^1:614 (1906).

6. **L. tenella** Nutt. Stems slender, 4 to 13 inches high, roughish with short gland-tipped hairs; leaf-blades mostly reddish-purple beneath, roundish in outline, 3 to 5-divided or -parted, the lobes again deeply lobed and toothed, often cuneiform; pedicels as long as the calyx; calyx campanulate, its tube acutish at base, with a ring-like swelling at the middle, bearing within an annular yellow gland; petals pinkish, 1¼ to 2½ lines long, palmately 3 or 5 to 9-cleft, the lateral lobes usually smaller and often merely tooth-like, or the petals sometimes pinnately cleft or toothed.

Mountain slopes and valleys, 2000 to 6000 feet: San Jacinto, San Bernardino and San Gabriel mountains; Sierra Nevada from Kern Co. to Modoc Co.; Siskiyou Co. to Mendocino Co. East to Arizona and the Rocky Mts., north to western Canada. Apr.-June.

Locs.—Mt. Waterman, *Peirson* 2442; Mt. San Antonio, acc. *Peirson;* Bear Valley, San Bernardino Mts., *Parish* 1321; Big Cottonwood Mdws. near Mt. Whitney, (Contrib. U. S. Nat. Herb. 4:281); Gilmore Lake, near Mt. Tallac, *Ottley* 887; Norval Flat, sw. Lassen Co., *C. S. Robinson;* Big Valley, Modoc Co., *M. S. Baker;* Edgewood, Siskiyou Co., *J. W. Kisling;* Yreka, *Butler* 652; Forest Glen, South Fork Trinity River, *Jepson* 16,649; Potter Valley, Mendocino Co., *Purpus*.

Refs.—LITHOPHRAGMA TENELLA Nutt.; T. & G. Fl. 1:584 (1840), type loc. Big Sandy and Siskadee rivers, Rocky Mts., *Nuttall;* Jepson, Man. 461 (1925). *Tellima tenella* Walp. Rep. 2:371 (1843). *T. tripartita* Greene, Erythea 1:106 (1893), type loc. San Jacinto Mts., Riverside Co. (formerly in San Diego Co.), *Emily Gregory*. *L. tripartita* Greene, Erythea 3:102 (1895).

L. rupicola Greene, Erythea 3:102 (1895), type loc. Modoc lava beds, *R. M. Austin*. *L. breviloba* Rydb. N. Am. Fl. 22:86 (1905), type loc. Sierra Co., *Lemmon* 647. *Tellima breviloba* Fedde, Just Bot. Jahresb. 33^1:614 (1906). *L. australis* Rydb. N. Am. Fl. 22:86 (1905), type loc. Cedar Creek, (Ariz. ?), *Newberry*. *Tellima australis* Fedde, Just Bot. Jahresb. 33^1:614 (1906).

7. **L. parviflora** Nutt. (Fig. 150.) Stems 7 to 15 inches high; leaf-blades twice palmately divided into narrowly ovate or linear segments, 4 to 8 lines wide, the cauline often 1½ to 2 times as large as the basal; calyx turbinate or clavate, 1½ to 2½ lines long, its tube rusty glandular-pubescent, somewhat annular-dilated at the middle; petals pink, rotate, 3-lobed or -cleft, 2½ to 4½ lines long.

Mountain valleys, 2300 to 4500 feet: San Emigdio and Tehachapi mountains; Lassen and Modoc Cos.; eastern Siskiyou Co. North to British Columbia, east to Colorado. Apr.-July.

Locs.—San Emigdio Cañon, *Davy* 2057; Rowen, Tehachapi Mts., *Jepson* 6726; Milford, Lassen Co., *M. S. Baker*; Susanville, *T. Brandegee*; Big Valley, Modoc Co., *M. S. Baker*; Shasta City, *Elna Long*.

Var. **trifoliata** Jepson comb. n. Calyx very narrow, 3 lines long; calyx-lobes lanceolate; corolla rose-color, 5 to 9 lines wide; petals very broad.—Butte Co. foothills.

Refs.—LITHOPHRAGMA PARVIFLORA Nutt.; T. & G. Fl. 1:584 (1840); Jepson, Man. 461 (1925). *Tellima parviflora* Hook. Fl. Bor. Am. 1:239, t. 78A (1834), type loc. "North California", *Menzies*, but he, the first collector, must have obtained it in Oregon or Washington. Var. TRIFOLIATA Jepson. *L. trifoliata* Eastw. Bull. Torr. Club 32: 200 (1905), type loc. Sierra Nevada foothills near Chico, *C. C. Bruce* 1844.

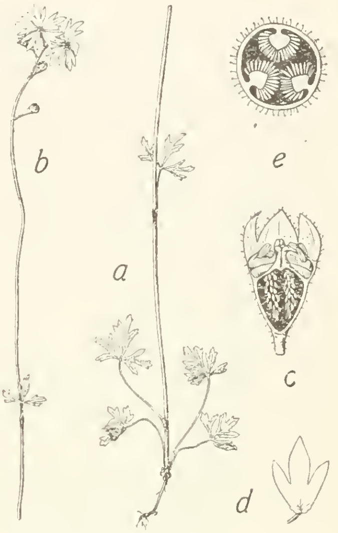

Fig. 150. LITHOPHRAGMA PARVIFLORA Nutt. *a*, base of plant, × ⅓; *b*, upper part of plant, × ⅓; *c*, long. sect. of fl. with corolla removed, × 2½; *d*, petal, × 1; *e*, cross sect. of ovary, × 5.

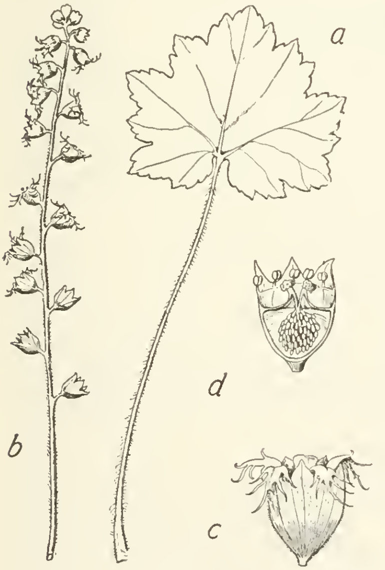

Fig. 151. TELLIMA GRANDIFLORA Dougl. *a*, basal leaf, × ½; *b*, infl., × ½; *c*, fl., × 2½; *d*, long. sect. of ovary, × 2½.

9. TELLIMA R. Br.

Perennial herbs with horizontal rootstocks. Stems simple, with a long terminal raceme of many flowers. Calyx inflated-campanulate, 10-nerved, its teeth erect. Petals at first whitish, soon changing to red, sessile by a broad base, laciniate-pinnatifid, reflexed from the first. Stamens 10. Ovary almost completely inferior, with 2 parietal placentae alternate with 2 styles. Capsule conical.—Species 1. (Name an anagram of Mitella.)

1. **T. grandiflora** Dougl. FRINGE-CUPS. (Fig. 151.) Stems 1½ to 3½ feet high, hirsute with spreading hairs, as also the petioles; leaf-blades roundish in outline, cordate at base, shallowy 3 to 5-lobed, serrate or crenate, 2 to 4 inches broad, the basal on petioles 2 to 9 inches long; flowers 3 to 4 lines long.

Woods, 50 to 4000 feet: Coast Ranges from the Santa Cruz Mts. to western Siskiyou Co.; Sierra Nevada in Plumas Co. North to Alaska. Apr.-July.

Locs.—Coast Ranges: Santa Cruz Mts. (Anderson, Nat. Hist. Santa Cruz Co. 37); Fish Ranch, Berkeley Hills, *Jepson* 13,461; Lake Temescal, nw. Alameda Co., *Chesnut;* Olema, Marin Co., *Jepson* 4036; Carlotta, Humboldt Co., *M. S. Baker;* Humboldt Bay, *Chandler* 1232; head of Indian Creek, Siskiyou Mts., *Jepson* 2945. Plumas Co.: Rich Point, Middle Fork Feather River, *Jepson* 10,616; Twain, *W. I. Follett;* Schneider Creek, *E. Fritz.* Orca, Alas., *Jepson* 428.

Refs.—TELLIMA GRANDIFLORA Dougl.; Lindl. Bot Reg. t. 1178 (1828); Jepson, Fl. W. Mid. Cal. 270 (1901), ed. 2, 199 (1911), Man. 461 (1925). *Mitella grandiflora* Pursh, Fl. 314 (1814), type loc. "Northwest Coast", *Menzies.*

10. **MITELLA** L.

Perennial herbs with rootstocks. Stems slender, often scape-like, ending in a spike-like raceme of small flowers. Calyx-tube about half-coherent with the ovary. Petals cleft. Stamens (in ours) 5, the filaments very short. Styles 2, short. Capsule opening before the seeds are ripe, the valves short and broad, forming a narrow rim to the pod.—Species 12, temperate and boreal regions of North America and Asia. (Diminutive of the Latin mitra, a cap, in allusion to the pod.)

Bibliog.—Piper, C. V., Mitella trifida Graham and its allies (Erythea 7:159–163,—1899). Rosendahl, C. O., Revision of the genus Mitella, with a discussion of geographical distribution and relationships (Engler, Bot. Jahrb. 50: suppleb. 375–397, figs. 1–9,—1914).

Petals whitish, palmately 3-cleft at apex; calyx broadly turbinate, its lobes triangular-lanceolate with acute sinuses, erect or little spreading; stamens erect; anthers ovate; styles simple; raceme 1-sided.
  Leaves obscurely lobed, crenate........................1. *M. trifida.*
  Leaves commonly 3-lobed above, not crenate........................2. *M. diversifolia.*
Petals greenish, pinnately cleft into capillary divisions; calyx dish-shaped or saucer-shaped, its lobes short and broad with obtuse sinuses, spreading (the limb, therefore, merely undulate); stamens inflexed; anthers reniform; styles 2-lobed; raceme not 1-sided.
  Disk of the flower inconspicuous; stems leafy........................3. *M. caulescens.*
  Disk of the flower conspicuous, the ovary imbedded in it; stems naked, scape-like.
    Stamens opposite the sepals (as in the two preceding).
      Leaf-blades mainly glabrous........................4. *M. breweri.*
      Leaf-blades with scattered hairs........................5. *M. ovalis.*
    Stamens opposite the petals........................6. *M. pentandra.*

1. **M. trifida** Graham. Plants 8 to 17 inches high; scapes and petioles retrorsely more or less hispid; leaf-blades round-cordate, crenate, obscurely lobed, short-hispid with scattered hairs or glabrous, $\frac{3}{4}$ to $2\frac{3}{4}$ inches broad; calyx-lobes whitish; petals linear, 3-cleft at apex.

Montane, in moist woods, 4800 to 6000 feet: Plumas Co.; northern Trinity Co.; Siskiyou Co. North to Saskatchewan. June-July.

Locs.—Nelson Creek, Plumas Co., *Hall* 9357; Union Creek, Salmon Mts.; Marble Mt., *Chandler* 1555a; Humbug Mt., Siskiyou Co., *Butler.*

Refs.—MITELLA TRIFIDA Graham, Edin. New Phil. Jour. 7:185 (1829), type a garden plant raised from seed collected in British America, *Drummond;* Hook. Fl. Bor. Am. 1:241, t. 82 (1834); Jepson, Man. 461 (1925). *Ozomelis trifida* Rydb. N. Am. Fl. 22:95 (1905).

M. anomala Piper, Erythea 7:162 (1899), type loc. mts. near Yreka, *Greene* 906; petals none; stamens short, included, or replaced by staminodia, these elongate-cuneate, palmately and acutely 3 to 5-cleft, exceeding the calyx-lobes (ex char.).

2. **M. diversifolia** Greene. Plants 10 to 16 inches high; pubescence as in no. 1; leaf-blades round-ovate in outline, cordate at base, most of them angularly 3-lobed above, the margin otherwise subentire, 1 to 3 inches long; calyx-lobes whitish; petals linear-cuneate, 3-cleft at apex.

Wet places in the mountains, 3500 to 6000 feet: Trinity Co. to western Siskiyou Co. North to Washington. July.

Locs.—Trinity Summit, Humboldt Co., *Davy* 5753; Coffee Creek, Salmon Mts.; Marble Mt., *Chandler* 1555; head of Long Gulch near Yreka, *Butler* 224; Humbug Mt., Siskiyou Co., *Butler* 1391.

Refs.—MITELLA DIVERSIFOLIA Greene, West Am. Sci 3:24 (1887), type loc. Trinity Summit, Humboldt Co., *C. C. Marshall;* Pitt. 1:32 (1887); Jepson, Man. 461 (1925). *Ozomelis diversifolia* Rydb. N. Am. Fl. 22:94 (1905).

3. **M. caulescens** Nutt. Stems 6 to 14 inches high, leafy; stems and petioles glandular-hispidulose with very unequal spreading hairs, the leaf-blades sparsely hispidulose; leaf-blades roundish-cordate, shallowly 5-lobed, irregularly crenate, ½ to 1⅞ inches wide, the basal on petioles 1½ to 2½ inches long, the 2 or 3 cauline shortly petioled; calyx yellowish, saucer-shaped, its lobes triangular; petals greenish, pinnately divided into 5 to 9 filiform lobes; filaments purplish; ovary only slightly inferior; styles distinct.

Moist shady places or cold wet meadows, 2000 to 5000 feet: Humboldt Co. North to British Columbia and Montana. June.

Locs.—Lawrence Creek, *Tracy* 6692; Bald Mt., *Tracy* 6361; Corral Prairie, Trinity Summit, *Tracy* 10,634.

Refs.—MITELLA CAULESCENS Nutt.; T. & G. Fl. 1:586 (1840), type loc. Columbia River near the mouth of the Willamette, *Nuttall*. *Mitellastra caulescens* Howell, Fl. Nw. Am. 201 (1898).

4. **M. breweri** Gray. Plants 6 to 12 inches high; petioles and scapes with scattered rusty hairs; leaf-blades round-cordate, shallowly lobed and crenate, 1½ to 3 inches broad, glabrous on the upper surface, nearly so below; pedicels 1 to 3 lines long; petals pinnately divided into 5 to 7 rather remote capillary divisions; capsule 1 line broad.

Montane meadows and moist woods, 6000 to 11,000 feet: Sierra Nevada from Tulare Co. to Sierra Co. North to British Columbia and northwestern Montana. July.

Note on the flower.—The short style-branches spread at right angles to the style proper, each 2-lobed with the lobes turned downward and somewhat divergent. The seeds are elliptic with somewhat rounded ends, whereas in M. pentandra Graham they are oblong with somewhat acute ends.

Locs.—Upper Kern River, *Jepson;* near Mt. Silliman, *Jepson* 744; Line Creek, Huntington Lake, *Jepson* 13,103; Sunrise trail, above Little Yosemite, *Jepson* 3165; head of Rafferty Creek, near Tuolumne Pass, *Kennedy;* Barrette Camp, 3 mi. s. of Tells Peak, Eldorado Co., *Kennedy* 61; Glen Alpine, Eldorado Co., *Ottley* 851.

Refs.—MITELLA BREWERI Gray, Proc. Am. Acad. 6:533 (1865), type loc. Mt. Hoffman, *Brewer;* Jepson, Fl. W. Mid. Cal. ed. 2, 201 (1911), Man. 462, fig. 454 (1925). *Pectiantia breweri* Rydb. N. Am. Fl. 22:93 (1905). *M. breweri f. lobata* Ros.; Engler, Jahrb. 50: suppleb. 385 (1914), Placer and Nevada Cos.

5. **M. ovalis** Greene. Plants 6 to 14 inches high; scapes and petioles rather densely pilose with somewhat downwardly turned hairs; leaf-blades round-ovate with cordate base, hirsute with scattered but rather conspicuous white or brown hairs, ¾ to 1¾ inches wide; pedicels 1 line long; petals pinnately divided into 3 capillary divisions (sometimes one lateral division wanting, often two wanting and the petals thus linear-subulate), or sometimes into 5 divisions (acc. to Greene).

Low ground, river bottoms or wet banks, 10 to 200 feet: Mendocino and Humboldt coasts. North to British Columbia. Apr.-May.

Locs.—Carlotta, *Tracy* 6176; Eureka, *Tracy* 818. It propagates by stolons and forms a carpet in moist places.

Refs.—MITELLA OVALIS Greene, West Am. Sci. 3:25 (1887), type loc. Mendocino Co., *Bolander;* Pitt. 1:32 (1887); Jepson, Man. 462 (1925). *Pectiantia ovalis* Rydb. N. Am. Fl. 22: 94 (1905).

6. **M. pentandra** Graham. Similar to M. breweri; petioles hairy, scapes not so glabrous; leaf-blades hispidulose with scattered hairs or glabrous; calyx-tube purple within; petals smaller, pinnately divided into about 5 to 7 capillary divisions; capsule 2 lines broad.

Montane, along shady cool streams, 5500 to 7500 feet: Sierra Nevada from Tulare Co. to Sierra Co.; western Siskiyou Co. North to Alaska and Saskatchewan, east to Colorado. June-July.

Locs.—Wolverton Creek, Tulare Co., *Hopping* 347; Home Camp Creek, Huntington Lake, *A. L. Grant* 1420; Long Mdw., Tuolumne Co., *Chesnut & Drew;* Deadman Creek, near Sonora Pass, *Jepson* 6568; Rubicon Park, Lake Tahoe; Yuba Pass, Sierra Co.; Marble Valley, *Butler* 219.

Refs.—MITELLA PENTANDRA Graham; Hook. Bot. Mag. t. 2933 (1829), type loc. alpine woods, n. Rocky Mts., *Drummond;* Jepson, Man. 462 (1925). *Pectiantia pentandra* Rydb. N. Am. Fl. 22:93 (1905).

11. HEUCHERA L. Alum Root

Perennial herbs with stout rootstocks. Leaves mostly basal, the blades rounded and shallowy lobed. Flowering stems scape-like, bearing a panicle of small flowers in cymose clusters. Calyx-tube adnate to the lower ½ of the ovary. Petals white, very small, clawed, entire, inserted on the throat of the calyx, or sometimes none. Stamens 5, ours with slender filaments. Capsule 1-celled, with 2 parietal placentae, dehiscent between the 2 beaks.—Species 27, North America. (J. H. Heucher, 1677–1747, German professor of medicine.)

Inflorescence spike-like; stamens shorter than the calyx-lobes; transmontane.
  Calyx 1 to 1½ lines long; petals present; se. Cal..........1. *H. novomexicana.*
  Calyx 2 to 3 lines long; petals none; ne. Cal..........2. *H. glabella.*
Inflorescence paniculate; stamens equal to or exceeding the calyx-lobes; cismontane except no. 6 which occurs both east and west of the Sierran axis.
  Petioles 1 to 8 inches long; leaf-blades 1 to 4 inches long.
    Calyx turbinate, greenish, thinly pilose, ½ to 1½ lines long..........3. *H. micrantha.*
    Calyx hemispheric, reddish, hirsute, often densely so, 1 to 2 lines long.
      Leaf-blades rather conspicuously lobed; panicle narrow but not dense..4. *H. maxima.*
      Leaf-blades shallowly lobed; panicle much contracted, rather dense..........5. *H. pilosissima.*
  Petioles ½ to 3 inches long; leaf-blades ½ to 1½ inches long; calyx reddish or purplish, the lobes greenish-tipped; lower part of calyx usually puberulent with short gland-tipped hairs, the middle and upper portion more or less pilose.
    Calyx turbinate-campanulate to cylindric; panicle loose..........6. *H. rubescens.*
    Calyx hemispheric; panicle dense..........7. *H. merriamii.*

1. **H. novomexicana** Wheelock. Range Alum-root. Plants 6 to 12 inches high, glandular-puberulent; scapes slender; leaf-blades 4 to 8 lines broad, roundish-cordate, the lobes roundish, ciliate; petioles ½ to 2 inches long; calyx turbinate to campanulate, yellowish; petals white, oval, shortly clawed, inconspicuous; ovary imbedded in the yellowish disk.

Rocky slopes, 10,000 to 11,000 feet: White Mts., Inyo Co. Southeast to New Mexico. July.

Locs.—North Fork Crooked Creek, *Jepson* 7260; County Line Hill, *Jepson;* Big Prospector Mdw., *J. Grinnell.*

Refs.—HEUCHERA NOVOMEXICANA Wheelock, Bull. Torr. Club 17:200 (1890), type loc. Santa Rita, N. Mex., *Wright* 1098; Jepson, Man. 463 (1925).

2. **H. glabella** T. & G. Mat Alum-root. Plants 6 to 14 inches high; scapes stoutish; herbage minutely puberulent, the leaf-blades glabrous or minutely ciliate; leaf-blades orbicular to broadly ovate, truncatish at base or rarely sub-cordate, shallowly lobed or toothed, 5 to 12 lines broad, the rounded teeth mucronulate; calyx yellowish, campanulate, puberulent; petals none or inconspicuous.

Montane, forming mats in rock clefts, 8000 to 9000 feet: Modoc Co. North to British Columbia. July.

Locs.—Medicine Lake, *M. S. Baker;* Mt. Bidwell, *Jepson* 7880; Mill Cañon, Warner Mts., *Manning* 274.

Refs.—HEUCHERA GLABELLA T. & G. Fl. 1:581 (1834), type loc. "Rocky Mts., towards Oregon", *Nuttall. H. cylindrica* var. *glabella* Wheelock, Bull. Torr. Club 17:203 (1890); Jepson, Man. 463 (1925).

H. CYLINDRICA Dougl. does not occur in Cal. probably. Its inclusion in Jepson, Man. 463, was an inadvertence.

3. **H. micrantha** Dougl. Crevice Alum-root. (Fig. 152.) Plants 1 to 3 feet high; scapes sometimes with a few more or less reduced leaves; petioles and scapes pilose-hirsute, the leaf-blades hirsutulous and the inflorescence glandular-puberulent; leaf-blades round- or ovate-cordate, 2 to 4 inches long, obtusely lobed and crenately toothed; flowers in an ample loose panicle; calyx shorter than the slender

pedicels, thinly soft-hairy; petals narrowly oblong, curving, rather shorter than the calyx.

Sloping banks of streams or faces of cliffs, often growing in rock crevices with ferns and mosses: near the coast, 100 to 1500 feet, from Santa Cruz Co. to Humboldt Co.; Sierra Nevada, 2200 to 7000 feet, from Tulare Co. to Butte Co. and n. to Siskiyou Co. North to Washington. May 15-July.

Locs.—Coast Ranges: Santa Cruz Co. (Anderson, Nat. Hist. Santa Cruz Co. 37); Berkeley, *Jepson* 10,019; Mt. Diablo, *Jepson* 9649; Mt. Tamalpais, *Jepson;* Howell Mt., *Jepson;* Redwood belt, Humboldt Co., *Chandler* 1231. Sierra Nevada: Middle Tule River, *Purpus* 5037; Cedar Creek, Sequoia Park, *Hopping* 153; Huntington Lake, *A. L. Grant* 1035; Vernal Fall, Yosemite, *Jepson* 13,459; Rosasco, Reed Creek, Middle Fork Tuolumne River, *Chesnut & Drew;* Italian Bar, Stanislaus River, *A. L. Grant;* Sly Park, Eldorado Co.; Little Chico Cañon, Butte Co., *R. M. Austin;* Sisson, Siskiyou Co., *Heller* 8060.

Var. **hartwegii** Ros. Scape with few reduced leaves; branches of the panicle remote, ½ to 1⅛ inches long, terminating in rather close clusters of flowers; calyx bowl-shaped or broadly turbinate, hairy, 1 to 1⅓ lines long, the lobes as long as the tube; petals exceeding the calyx-lobes.—Shady places, 20 to 500 feet: Monterey coast line from Monterey to Point Sur. May-June. This form, a very narrow endemic, is but slightly known. The styles in our material (Little Sur River, *Davy* 7312) are very short. Full material is much needed and should be collected with reference to the possible existence of sexual differentiation in the flowers. The styles appear to be shorter than the calyx-lobes, but observations should be made on mature flowers.

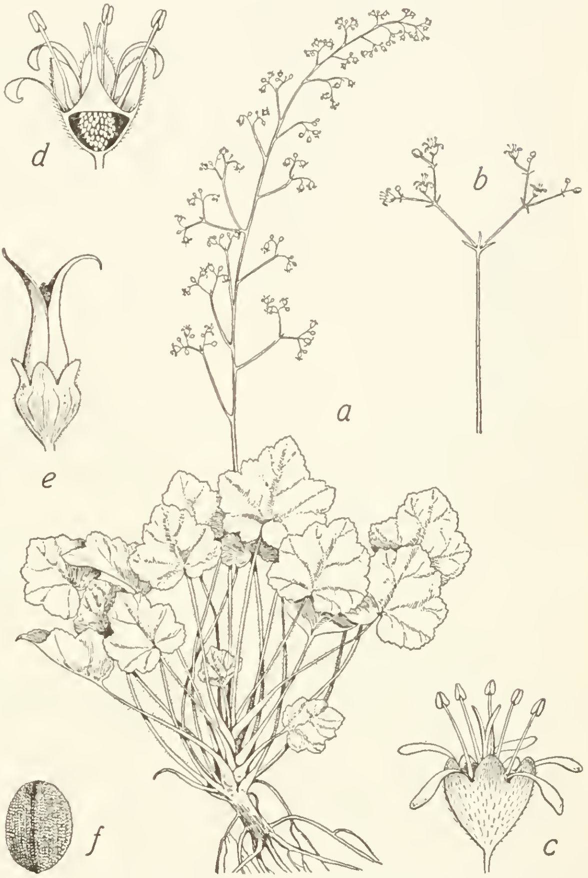

Fig. 152. HEUCHERA MICRANTHA Dougl. *a*, habit, × ⅛; *b*, branch of infl., × ½; *c*, fl., × 6; *d*, long. sect. of fl., × 6; *e*, capsule, × 3½; *f*, seed, × 12.

Refs.—HEUCHERA MICRANTHA Dougl. Bot. Reg. t. 1302 (1829), type loc. Grand Rapids, Columbia River, *Douglas;* Jepson, Fl. W. Mid. Cal. 271 (1901), ed. 2, 200 (1911), Man. 463, fig. 456 (1925). Var. *erubescens* Ros.; Engler, Bot. Jahrb. 37^2: beibl. 83:77 (1905). *H. erubescens* Braun & Bouché, Ind. Sem. Hort. Berol. App. 2 (1871). Var. HARTWEGII Ros.; Engler, l.c. *H. pilosissima* var. *hartwegii* Wats.; Wheelock, Bull. Torr. Club 17:195 (1890), type loc. Monterey, *Hartweg* 1742. *H. pilosissima* Benth. Pl. Hartw. 311 (1849), not F. & M. *H. hartwegii* Rydb. N. Am. Fl. 22:102 (1905).

HEUCHERA LONGIPETALA DC. Prod. 4:52 (1830), Moc. & Ses. Calq. des Dessins, t. 423 (1874), is doubtful but may be Heuchera micrantha Dougl. The detail of the calyx in the drawing suggests Tolmiea menziesii T. & G. The drawing was made from a plant collected at Nootka by Mociño, who was on Vancouver Island in 1792.

4. **H. maxima** Greene. JILL-O'-THE-ROCKS. Plants with the habit and aspect of H. micrantha; leaf-blades roundish-cordate, rather markedly lobed, 1½ to 6¾

inches wide, the margin minutely bristly-ciliate; panicle rather narrow (6 to 9 inches long, 1 to 2½ inches wide), cylindric or subcylindric in outline, not so open as compared with H. micrantha; calyx hirsute, bowl-shaped or hemispheric, 1½ lines long.

Rocky banks or cliffs, along the coast line, 20 to 800 feet: Monterey Co. to the Santa Barbara Islands. May-June.

Locs.—Lucia, Santa Lucia Mts., *Jepson* 1668; Gorda, Monterey coast, *K. Brandegee;* Santa Rosa Isl., *T. Brandegee;* Pelican Bay, Santa Cruz Isl., *Jepson* 12,124.

Refs.—HEUCHERA MAXIMA Greene, Bull. Cal. Acad. 2:149 (1886), type loc. n. side of Santa Cruz Isl., *Greene. H. hemisphaerica* Rydb. N. Am. Fl. 22:112 (1905), type loc. Santa Lucia Mts., *T. brandegee. H. pilosissima* var. *hemisphaerica* Ros.; Engler, Bot. Jahrb. 37^2: beibl. 78 (1905). *H. pilosella* Rydb. l.c., type loc. near San Luis Obispo, *Palmer* 124.

5. **H. pilosissima** F. & M. COAST ALUM-ROOT. Plants 1 to 2 feet high; petioles and scapes glandular-pilose; leaf-blades roundish-cordate, or cordate-ovate, 1 to 3 inches wide, hirsutulose, shallowly lobed, the lobes with rounded bristle-tipped crenations; flowers in close clusters, the panicle narrow or contracted, much less ample than in H. micrantha; calyx globular, densely hispid with white hairs, exceeding or almost equaling the pedicel; petals narrowly linear.

Rocky wooded slopes along the coast line, 50 to 1000 feet: Monterey Co. to Mendocino Co. May-June.

Note on variation.—This species is perhaps even more variable than H. rubescens Torr. No two plants studied by us are quite alike, but differ much in detail. The clusters of flowers or the inflorescences as a whole are variously contracted; the basal leaf-sinus is open or conspicuously closed; the habit is inconstant. In typical state Heuchera pilosissima is rare and we have only the following collections: Pt. Lobos, Monterey Co., *Heller* 6803; Big River, Mendocino Co., *Bolander* 4830; Noyo River, *T. Brandegee.*

Refs.—HEUCHERA PILOSISSIMA F. & M. Ind. Sem. Hort. Petrop. 5:36 (1838), type loc. Ross, Sonoma Co.; Linnaea, 13, litt.-bericht. 110 (1839); Erythea 2:165 (1894); Jepson, Fl. W. Mid. Cal. 271 (1901), ed. 2, 200 (1911), Man. 463 (1925). *H. hispida* H. & A. Bot. Beech. 347 (1840), type from Cal., *Douglas. H. hirtiflora* T. & G. Fl. 1:582 (1840).

6. **H. rubescens** Torr. JACK-O'-THE-ROCKS. Plants 5 to 12 inches high, the scapes sparingly hirsutulose or nearly glabrous; leaf-blades ½ to 1½ inches broad, round-cordate, shallowly lobed, the lobes crenate with subacute teeth, the teeth ciliate, bristle-tipped; petioles pilose; panicle open or narrow, the branches spreading from the main axis, sometimes horizontal; calyx 2 to 3 lines long, its tube turbinate-cylindric, becoming urnshaped in age; petals linear to narrow-oblanceolate; stamens as long as or longer than the petals.

Rocky slopes, 6000 to 10,500 feet: higher Sierra Nevada and especially its east slope. East to Utah, south to Arizona and north to Oregon. July.

Locs.—Above Donner Lake, *Sonne* 474; Castle Peak (Mt. Stanford), *Sonne* (petioles glabrous or sparsely puberulent); Bloody Cañon, Mono Co., *Jepson* 4454. The following varieties are of slight importance and all show intergradations, especially the first two.

Var. **nevadensis** Jepson nom. n. Leaf-blades mostly 4 to 9 lines broad, truncatish or subcordate at base; petioles short (½ to ¾ or rarely to 2 inches long); calyx turbinate-campanulate.— Montane, clefts of granite or rocky slopes, mostly 6000 to 10,500 feet: west slope of the Sierra Nevada from Tulare Co. to Siskiyou Co.; White Mts. June.

Locs.—Mt. Whitney, *Jepson* 1094; Kern-Kaweah River, *Jepson* 5023; Farewell Gap, *Jepson* 1037; Mt. Silliman, *Hopping* 329; Roaring River, Kings Cañon, *Newlon* 234; Heart Lake, nw. Inyo Co., acc. *Peirson;* Home-camp Creek, Huntington Lake, *A. L. Grant* 1419; Lake Merced, Yosemite Park, *Jepson* 3202; Shasta River, *Butler* 216. White Mts.; Cottonwood Creek, *Jepson* 7378.

Var. **parishii** Jepson. Leaf-lobes of the older leaves mostly very short and rounded, entire or sparingly toothed; calyx-tube cylindric-turbinate, 2½ to 3 lines long; stamens exserted.—San Bernardino Mts.; San Jacinto Mts. In our specimen of *Parish* 2512 (isotype of H. parishii Rydb.), truncatish or rounded leaf-lobes characterize one individual, obscurely acutish lobes the other individual.

Var. **elegans** Jepson. (Fig. 153.) Plants 6 to 14 inches high; scapes pilose; leaves ½ to 1⅜ inches wide; panicle narrow or virgate, its branches erect or ascending; flowers 3 to 4 lines long;

calyx light purple, glandular-puberulent and often also slightly hairy, its tube vase-shaped, cylindric or in age somewhat urnshaped; stamens much shorter than the petals.—Rocky mostly pine slopes, 5000 to 8800 feet: San Gabriel, San Bernardino, San Jacinto and Cuyamaca mountains. July.

Locs.—Mt. Lowe, *Peirson* 67; Cucamonga Peak; Mt. San Antonio; Bear Valley, San Bernardino Mts., *Parish* 1820; Bear Creek Cañon, San Bernardino Mts.; Toro Peak, Santa Rosa Mts., *Munz* 5785; Cuyamaca Mts.

Var. **abramsii** Jepson comb. n. Plants 3 to 5 (or 9) inches high, similar to var. elegans; scapes merely puberulent; panicles narrow; flowers 2½ lines long; calyx dark crimson, merely glandular-puberulent.—Rocky places, 9000 to 10,000 feet: Mt. San Antonio (*Peirson* 3207); Mt. San Gorgonio; Mt. San Jacinto.

Var. **alpicola** Jepson var. n. Plants 4 to 7 inches high; leaf-blades truncatish at base or subcordate, 3 to 6 lines wide; panicle small (1 to 3 inches long); calyx somewhat dull.—(Plantae unc. 4–7 altae; folia basi subtruncata vel subcordata, lin. 3–6 lata; panicula parva (unc. 1–3 longa); calyx paulo hebes.)—High montane, 10,000 to 12,000 feet: Sierra Nevada from Mariposa Co. (Benson Lake, *Jepson* 3377, type) to Tulare Co. (Mt. Whitney, *Burton & Ryerson* 56).

Refs.—HEUCHERA RUBESCENS Torr. Stansb. Expl. Great Salt Lake, 388, t. 5 (1852), type loc. Stansbury Isl., Salt Lake, *Stansbury;* Jepson, Fl. W. Mid. Cal. 271 (1901), ed. 2, 200 (1911), Man. 463 (1925). *H. lithophila* Hel. Muhl. 1:105 (1904), type loc. Summit sta., Donner Pass, *Heller* 7028. *H. pachypoda* Greene, Lflts. 1:111 (1905), type loc. near Lone Pine, Inyo Co. (7000 ft.), *Jones. H. rubescens* var. *glandulosa* Kell. Proc. Cal. Acad. 5:45 (1873), type loc. Castle Peak (formerly Mt. Stanford), *Kellogg.* Var. NEVADENSIS Jepson. *R. rubescens* var. *pringlei* Jepson, Man. 463 (1925); not H. pringlei Rydb. Var. PARISHII Jepson, l.c. *H. parishii* Rydb. N. Am. Fl. 22:109 (1905), type loc. Mill Creek Falls, San Bernardino Mts., *Parish* 2512. *H. hirsuta* Rydb. l.c., type loc. Snow Cañon, e. San Bernardino Mts., *Parish* 5062. *H. elegans* var. *hirsuta* Ros.; Engler, Bot. Jahrb. 37^2: beibl. 78 (1906). Var. ELEGANS Jepson, l.c. *H. elegans* Abrams, Bull. S. Cal. Acad. 1:67 (1902), type loc. Martins Camp, Mt. Wilson, San Gabriel Mts., *Abrams* 1903. *H. caespitosa* Eastw. Proc. Cal. Acad. ser. 2, 6:426 (1896), type loc. San Emigdio Cañon, Kern Co., *Jasper.* Var. ABRAMSII Jepson. *H. abramsii* Rydb. N. Am. Fl. 22:109 (1905), type loc. Mt. San Antonio, *Abrams* 1924. Var. ALPICOLA Jepson.

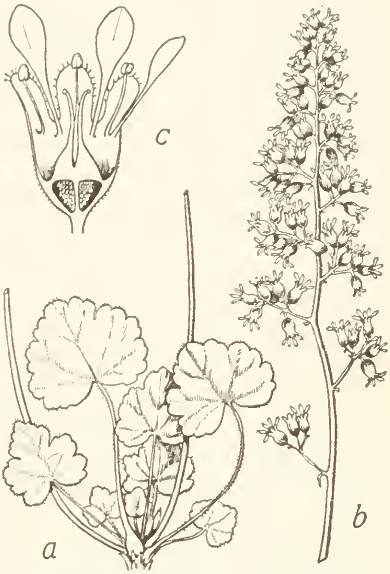

Fig. 153. HEUCHERA RUBESCENS Torr. var. ELEGANS Jepson. *a*, base of plant, × ½; *b*, infl., × ½; *c*, long. sect. of fl., × 3.

7. **H. merriamii** Eastw. Plants 8 to 11 inches high; scapes and petioles sparsely hirsutulose or subglabrous; leaf-blades sub-orbicular, shallowly lobed and crenately toothed, truncatish at base, ¾ to 1¾ inches wide; panicle contracted or dense, minutely glandular-puberulent; flowers 2½ to 3 lines long; calyx-lobes ellipsoid or oblong, very obtuse, dark red; calyx-tube hemispheric; petals lanceolate; stamens exserted.

Higher mountains, 6000 to 7000 feet: Trinity and Siskiyou Cos. Aug.

Loc.—Marble Valley, w. Siskiyou Co., *Butler* 221.

Refs.—HEUCHERA MERRIAMII Eastw. Bull. Torr. Club 32:199 (1905), type loc. Cañon Creek, Salmon Mts., Trinity Co., *C. Hart Merriam.*

H. PRINGLEI Rydb. N. Am. Fl. 22:111 (1905), type loc. Castle Lake, Scott Mts., *Pringle.* Plants about 6 inches high; leaf-blades suborbicular, truncatish at base, the lobes ovate, acute; panicle 1½ to 2 inches long, very narrow; flowers 1 to 1½ lines long; calyx bowl-shaped, its lobes ellipsoid, obtuse.—Salmon Mts.; the material still too scanty to permit proper study.

12. TOLMIEA T. & G.

Perennial herb. Stems ending in a raceme. Leaves chiefly basal. Petals 5 or 4, filiform, subulate, elongated, inserted in the sinuses of the calyx, recurved, persistent. Calyx tubular, with 5 unequal lobes (2 large, 3 small), deeply cleft down one side, with protruding pistil. Stamens 2 or 3, with broad filaments, inserted in throat of calyx opposite the upper and lateral lobes. Calyx narrow. Ovary free from the calyx, long-oblong, attenuate at base, 2-cleft at apex; placentae 2, parietal; styles 2, slender. Capsule membranous, with 2 diverging equal beaks, tapering at base.—Species 1. (Dr. W. F. Tolmie, medical officer of the Hudson Bay Co. at Fort Vancouver in 1832 and after, botanical collector.)

1. **T. menziesii** T. & G. Stems slender, 1½ to 2¼ feet high; leaf-blades round-cordate or cordate-ovate, lobed, irregularly serrate, 1¼ to 3½ inches broad; flowers 4 lines long.

Mountain streams near the coast, 50 to 2500 feet: Santa Cruz Mts.; Mendocino Co. to w. Siskiyou Co. North to Alaska. July-Aug.

Biol. note.—Adventitious buds are commonly produced at the summit of the petioles of the basal leaves and often also on the cauline leaves. They fall away, take root and thus multiply the plant vegetatively. The calyx is ordinarily bilabiate in form, the sepals occurring in two unequal sets. The 3 upper sepals, spreading upwards and backwards, are of the same length, while the 2 equal lower sepals are turned downwards.

Locs.—Boulder Creek, Santa Cruz Mts., *W. I. Follett;* Mendocino City, *Bolander* 4792; Booths Run, se. of Eureka, *M. S. Baker* 154; Arcata, *Chesnut & Drew;* Martin Ranch, South Fork, Trinity River, *Jepson* 2013; Weitchpek, Klamath River, *Blasdale;* Indian Creek, Siskiyou Mts., *Jepson* 2940.

Refs.—TOLMIEA MENZIESII T. & G. Fl. 1:582 (1840); Jepson, Man. 464 (1925). *Tiarella menziesii* Pursh, Fl. 313 (1814), type loc. Bank's Isles, Northwest Coast, *Menzies. Heuchera menziesii* Hook. Fl. Bor. Am. 1:237 (1834). *Leptaxis menziesii* Raf. Fl. Tell. 2:76 (1836).

13. **CHRYSOSPLENIUM** L. GOLDEN SAXIFRAGE

Low herbs with leafy stems, ours perennial and with opposite leaves. Flowers solitary, small, greenish-yellow. Calyx rotate, 4-lobed. Petals none. Stamens 4 or 8. Capsule 1-celled, with 2 parietal placentae.—Species about 40, North and South America and Europe, but chiefly Asia. (Greek chrysos, gold, and splen, spleen, the plants used medicinally.)

1. **C. glechomaefolium** Nutt. Stems ascending, 5 to 10 inches long; leaf-blades roundish, crenate, truncatish and entire at base, 3 to 7 lines long; flowers 1½ to 2 lines broad.

Wet mucky ground in shade, 5 to 200 feet: coast of Mendocino and Humboldt Co. North to British Columbia. Apr.

Locs.—Navarro River, *Edith Byxbee;* Eureka, *Tracy* 4888. Portland, Ore., *Henderson* 314.

Refs.—CHRYSOSPLENIUM GLECHOMAEFOLIUM Nutt.; T. & G. Fl. 1:589 (1840), type loc. "Oregon", that is on the Columbia River, *Scouler;* Jepson, Man. 464, fig. 458 (1925). *C. scouleri* Rose, Bot. Gaz. 23:277 (1897), resting on *C. oppositifolium* var. *scouleri* Hook. Fl. Bor. Am. 1:242 (1840), type loc. "Columbia River on the Northwest Coast", *Scouler.*

14. **PARNASSIA** L. GRASS OF PARNASSUS

Glabrous perennial herbs with entire petioled leaves in a basal tuft. Stems scape-like, bearing a single terminal white flower and commonly a single small sessile leaf. Sepals slightly united at base. Petals greenish- or yellowish-veined, each bearing at base a cluster of gland-tipped sterile filaments. Stamens 5, alternate with the petals. Ovary 1-celled; stigmas 4 (or 3), sessile, opposite the same number of placentae. Capsule 3 or 4-valved, the valves placenta-bearing along their middle.—About 19 species, north temperate and arctic regions. (Called Grass of Parnassus by Dioscorides, from Mt. Parnassus.)

Petals entire, not clawed, many-veined; leaf-blades ovate, cuneate at base................1. *P. palustris.*
Petals fimbriate at the basal sides, clawed, few-veined.
    Leaf-blades oval; petioles broad, 6 to 12 lines long; staminodia 2 lines long; bract ovate........2. *P. cirrata.*
    Leaf-blades cordate to reniform; petioles 2 to 5 inches long; staminodia ½ line long; bract cordate................3. *P. fimbriata.*

1. **P. palustris** L. var. **californica** Gray. Scape 5 or 9 to 16 inches high; leaf-blades round-ovate to elliptic, 1 to 1¾ inches long, contracted at base into a petiole; petals oval or obovate, 6 to 9 lines long; sterile filaments capillary, 20 to 24 in a set, united to the middle.

Wet meadows: near the coast, 1500 to 2500 feet, from the Santa Cruz Mts. to Marin Co.; high montane, 6300 to 11,000 feet, in the San Bernardino Mts. and in the Sierra Nevada from Tulare Co. to Eldorado Co. and north to Mt. Shasta. North to southwestern Oregon. Aug.-Nov.

Locs.—S. Cal.: South Fork Santa Ana Mdws., San Bernardino Mts., *Peirson* 2249. Coast Ranges: Loma Prieta, *Davy* 379; Bootjack Camp, Mt. Tamalpais, *Jepson* 10,304; Red Mt., n. Mendocino Co., *C. P. Bonsall.* Sierra Nevada: Alta Mdws., Tulare Co., *Hopping* 506; Whitney Creek, Kern Cañon, *Jepson* 1098; Bubbs Creek, *Hopping* 167; Heart Lake, Rock Creek, nw. Inyo Co., acc. *Peirson;* Lake of the Lone Indian, Fresno Co., *A. L. Grant* 1550; Mono Hot Sprs., Fresno Co., *A. L. Grant* 1482; Kennedy Mdw., East Fork of Middle Stanislaus River, *A. L. Grant* 462; Sonora Pass, *A. L. Grant* 347; Grass Lake near Fallen Leaf, *Jepson* 8158; Mt. Shasta, e. slope, *M. S. Baker.*

Refs.—PARNASSIA PALUSTRIS L. Sp. Pl. 273 (1753), type European. Var. CALIFORNICA Gray, Bot. Cal. 1:202 (1876), type loc. Mariposa Co.; Howell, Erythea 3:179; Jepson, Fl. W. Mid. Cal. 271 (1901), ed. 2, 200 (1911), Man. 465, fig. 459 (1925). *P. californica* Greene, Pitt. 2: 102 (1890).

2. **P. cirrata** Piper. Similar to no. 1; rootstock more slender; petals not so broad.

Meadows, 2500 to 8000 feet: San Bernardino Mts.; San Gabriel Mts.; Mt. Shasta region. Rare.

Locs.—Vivian Creek, Mt. San Gorgonio (acc. *Peirson*); North Fork San Gabriel River (Lorquinia 2:22); upper Sacramento River (Erythea 7:128).

Refs.—PARNASSIA CIRRATA Piper, Erythea 7:128 (1899), type loc. Gilman Cañon, Mt. San Bernardino, *S. B. & W. F. Parish;* Parish, Pl. World 20:216 (1917); Jepson, Man. 465 (1925).

3. **P. fimbriata** König. Also similar to no. 1; leaf-blades ¾ to 1¾ inches broad.

Mountain meadows: Modoc Co. North to Alaska, east to Colorado. July-Aug.

Locs.—Deer Park, Placer Co., *Helen Geis;* Bowman Lake, Nevada Co., *A. M. Carpenter;* Owl Creek Cañon, Warner Mts., *L. S. Smith* 1049.

Refs.—PARNASSIA FIMBRIATA König, Ann. Bot. 1:391 (1805), type loc. Northwest Coast, *Menzies;* Jepson, Man. 465 (1925).

15. **PHILADELPHUS** L. SYRINGA. MOCK ORANGE

Deciduous shrubs with opposite leaves. Flowers white, showy, in ours in a terminal raceme or thyrse. Calyx-limb 4 or 5-parted, valvate in the bud, persistent. Petals 4 or 5, convolute in the bud. Stamens 20 to 40. Ovary inferior, in ours 4-celled; styles 4 (3 to 5), distinct above the middle or at apex. Capsule loculicidally 4-valved, the valves commonly splitting a little at apex between the partitions; placentae projecting from above the middle of the axis, bearing many seeds.—Species about 13, North America and Asia. (Name of an Egyptian King, the application not obvious.)

Leaves green on both faces; calyx-tube green, glabrous or subglabrous; along streams.................. 1. *P. lewisii.*

Leaves whitish-pubescent, at least beneath; calyx-tube whitish-pubescent; on rocks.......................... 2. *P. microphyllus.*

1. **P. lewisii** Pursh var. **californicus** Gray. Loosely branching, 4 to 11 feet high; herbage varying from glabrous or with very slight trace of pubescence to obviously hairy; leaf-blades ovate, acute, commonly entire or a little dentate, 1½ to 3 inches long, on petioles 2 to 4 lines long; flowers ¾ to 1¼ inches broad; petals 4, elliptic; styles commonly 4, distinct the upper ¼ to ½.

Along water courses, 1100 to 4000 feet: Sierra Nevada from Tulare Co. to Shasta Co.; Humboldt Co. May-July.

Geog. note.—In the Sierra Nevada the shrubs have the leaves commonly entire or subentire and glabrous or only slightly pubescent. This form represents the var. californicus Gray. In the Coast Ranges the leaves tend to be more markedly dentate and more evidently hairy. This is the var. gordonianus Jepson. There are, however, intermediate forms, especially in Siskiyou Co., with entire pubescent leaves: Yreka, *Butler* 405; Quartz Valley, Shackelford Creek, *Butler* 87. The leaves (2 to 5 inches long) of sterile shoots of var. gordonianus are markedly hairy in all specimens before us, as well as more conspicuously dentate than the leaves of the fertile shoots; in some specimens the under side of the lower leaves of a fertile shoot are hairy, the under side of the upper pair subglabrous (Sommes Bar, n. Humboldt Co., *Chandler* 1523). Subtypical var. californicus may occur in the Coast Ranges (Campbell Creek, Hupa, *Chandler* 1333) and typical var. gordonianus in the Sierra Nevada (Bear Valley, Nevada Co., *Jepson* 13,450). The styles of the flowers are commonly 4, their free portion varying from ¼ to ½ their length, but not in association with any other character. We regard these two varieties, then, as unimportant forms morphologically although having a little geographic significance.

Field note.—The foliage is browsed by the deer, these animals being extremely fond of the young shoots. The ripe seed are eaten by quail and by squirrels. The straight shoots of var. gordonianus Jepson furnished the Hupas, native tribesmen, with an effective arrowshaft for the chase and for war; it was tipped with a short foreshaft made of the hard wood of Amelanchier alnifolia Nutt.

Locs.—Sierra Nevada: Clough Cave, South Fork Kaweah River, *Jepson* 4656; Cedar Creek, Sequoia Park, *Jepson* 594; Merced Cañon above El Portal, *Jepson* 8351; Bower Cave to Hazel Green, *Jepson* 13,451; Hetch-Hetchy, *Jepson* 3413, 4618; Parrots Ferry, nw. Tuolumne Co., *A. L. Grant;* Italian Bar, Stanislaus River, *Jepson* 6362; Gwin Mine, Calaveras Co., *Jepson* 13,481; Belden, Plumas Co., *Jepson* 4152; Rich Point, Middle Fork Feather River, *Jepson* 10,628; Payne Creek, e. Tehama Co., *Jepson* 12,344; Sims, Shasta Co., *M. A. Howe;* Delta, Shasta Co., *Jepson* 6185; Hupa, *Chandler* 1333.

Var. **gordonianus** Jepson. Leaves often dentate, more obviously hairy than in var. californicus.—Mendocino Co.; Humboldt Co. North to British Columbia.

Locs.—Williams Forks, ne. Mendocino Co., *Jepson* 13,449; betw. head of Yager Creek and Bridgeville, *M. S. Baker* 78; Horse Mt., Humboldt Co., *Tracy* 7696; Redwood Creek, n. Humboldt Co., *Jepson* 1964, 1964a; Hupa Valley, *Jepson* 2124.

Refs.—PHILADELPHUS LEWISII Pursh, Fl. 1:329 (1814), type loc. Clarks River, *Lewis.* Var. CALIFORNICUS Gray, Bot. Cal. 1:202 (1876); Jepson, Fl. W. Mid. Cal. ed. 2, 201 (1911), Man. 465, fig. 460 (1925). *P. californicus* Benth. Pl. Hartw. 309 (1849), *Hartweg* 375, collected on the excursion to Bear Valley from the Sacramento Valley, in the Pinus ponderosa belt (cf. Jepson, Erythea 5:55). *P. cordifolius* Lange, Fort. Landboh. Fril. 66 (1871), based on cultivated plants. *P. fremontii* Rydb. N. Am. Fl. 22:165 (1905), type loc. North Fork American River, *Fremont* 511. *P. platyphyllus* Rydb. l.c. 167 (1905), type loc. Mt. Shasta (s. side), *H. E. Brown* 561. Var. GORDONIANUS Jepson, Man. 466 (1930). *P. gordonianus* Lindl. Misc. 21 (1838), type loc. Columbia River, *Douglas.*

2. **P. microphyllus** Gray. Shrub 1 to 2½ feet high; leaf-blades elliptic-oblong, strigose-pubescent and whitish beneath, hirsutulose and greenish above, 3 to 7 lines long, the petioles very short (about ½ line); calyx white-pubescent, its lobes acuminate; petals white, broadly elliptic, 3 to 4 lines long.

Cliffs or rocky places in the high mountains, 7500 to 8500 feet: Mt. San Jacinto; White Mts. East to New Mexico and Colorado. Aug.

Locs.—Dark Cañon, Mt. San Jacinto, *Peirson* 4991; White Mts., Mono Co., *Shockley* 454.

Refs.—PHILADELPHUS MICROPHYLLUS Gray, Mem. Am. Bost. Soc. Nat. Hist. 4:54 (1849), type loc. Santa Fé Creek, N. Mex., *Fendler. P. pumilus* Rydb. N. Am. Fl. 22:173 (1905), type loc. Tamarack Valley, San Jacinto Mts., *Hall* 2500; Dav. & Mox. Fl. S. Cal. 172 (1923). *P. stramineus* Rydb. l.c. 172 (1905), type loc. White Mts., Mono Co., *Shockley.*

16. CARPENTERIA Torr.

Shrub with opposite entire leaves and white flowers in a terminal cyme. Calyx 5 (or 6)-parted, its very short tube adnate to middle of ovary. Petals 5 or 6 (to 8). Stamens numerous (150 to 200). Ovary incompletely 5 (2 to 8)-celled, that is, with 5 (2 to 8) partitions originating on the walls and approximating but not united in the axis (unless at base), the inner margins of the partitions bearing on each side a placental plate; placental plates projecting into the incomplete "cells" (2 plates to each "cell"), and bearing numerous ovules on both surfaces. Style one, short, bearing commonly 10 longitudinal stigmatic ridges, each pair of ridges representing a 2-lobed stigma. Capsule depressed-globose, loculicidal.—Species 1. (Professor W. M. Carpenter of Louisiana, first half of 19th century.)

Bibliog.—Gray, A., Carpenteria, Torr., char. emend. (Proc. Am. Acad. 15:42–43,—1879). Hooker, J. D., Carpenteria californica (Bot. Mag. t. 6911,—1886). Greene, E. L., Carpenteria californica (Pitt. 1:66–68, 141,—1887). Jepson, W. L., [The rediscovery of] Carpenteria californica (Erythea, 5:124,—1897); The long-lost Carpenteria (Sierra Club Bull. 11:151–153, pl. 46,—1921). Cf. also Gard. Chron. n.s. 26:115 (fig. 22), 149, 174, 306, 339 (1886).

1. **C. californica** Torr. (See Frontispiece.) Erect, 3 to 8 feet high; leaf-blades oblong, tapering to base and apex, the margins somewhat revolute, green and glabrous above, white-tomentulose beneath, 2 to 4 inches long, short-petioled; flowers 2 to 2½ inches broad; petals orbicular, rotately spreading.

Along streams or shallow gullies on wooded slopes in the higher foothills, 1500 to 4000 feet: Sierra Nevada from the San Joaquin River cañon to the north slope of Kings River cañon. May.

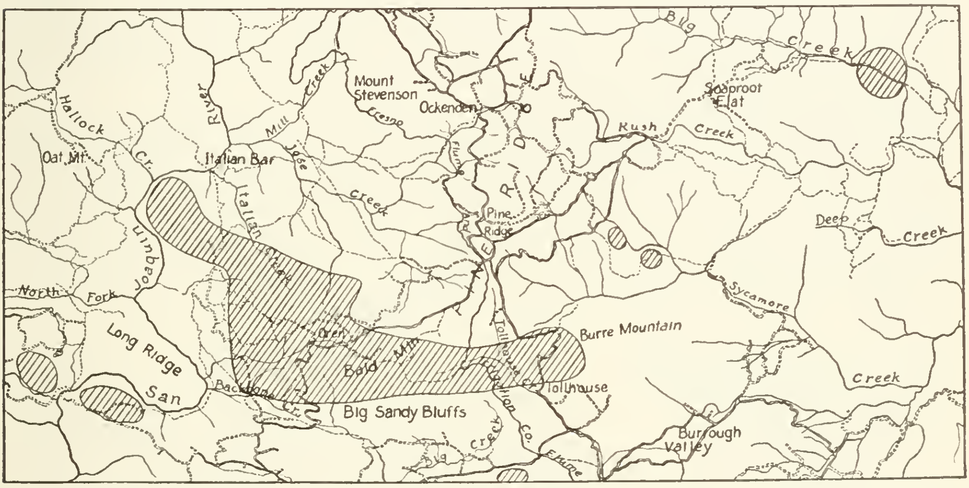

Fig. 154. Carpenteria californica Torr. Map showing the distribution of Carpenteria, one of the most remarkable of the narrow endemics of California, in the Pine Ridge country which lies between the main San Joaquin River and the Big Creek tributary of Kings River, Sierra Nevada. The longitudinal range is 20 miles, the altitudinal range from about 1500 to 4000 feet.

History of discovery.—John Torrey, in his original description of Carpenteria californica, cites as the collector's locality, "Sierra Nevada of California, probably on the headwaters of the San Joachin", *Fremont.* The shrub was not re-collected for a long time and Fremont's station remained a mystery. Exploration of the high Sierra Nevada did not turn up the shrub and besides it was well known that Fremont did not cross the Sierra Nevada in the region of the montane waters of the San Joaquin. It was more certain still that the species did not grow in the Great Valley along the San Joaquin River or elsewhere. At the meeting of the California Academy of Sciences on Sept. 4, 1876, flowering specimens of Carpenteria californica were exhibited by Gustav Eisen and identified by Dr. Albert Kellogg (Proc. Cal. Acad. 7:110,—1877). Finally the shrub had been re-discovered in the Sierra foothills at Grapevine Spring on the mountain road between Tollhouse and Ockenden, Fresno Co., in 1875 (cf. Erythea 5:124). On reaching Walker Lake on his 1845 expedition Fremont divided his command, sending his lieutenant, Joseph Walker, south along the east side of the Sierra Nevada to make a winter camp on Kern River and await Fremont's coming in the early spring. Fremont himself crossed the Sierra Nevada at or near Donner Pass on December 5 and obtained supplies at Sutter's Fort. On his way to rejoin Walker, traveling south through the Great Valley, Fremont crossed the San Joaquin River, a full-flooded stream emerging from the Sierras, and on meeting the Kings River mistook it for the Kern and made a fruitless attempt in midwinter to breast the most impassable portion of the Sierra Nevada between the San Joaquin and the main Kings. Without any question, it was while engaged on this adventure, during which he was baffled and turned back to the San Joaquin plain, that he discovered this very rare endemic (cf. map with his Geographical Memoir of Upper California). His specimens, though taken so much out of season, show, characteristically, vestiges of flowers, because of the persistence of the petals and other organs. Carpenteria, as we now know, is one of the rarest and most restricted in range of Californian shrubs. (See figure 154.) Stations may be cited as follows: north bank of San Joaquin River near Lake Corine; Italian Creek; Backbone Creek and the slope above Auberry; Grapevine Spring (on headwaters of Big Dry Creek); Big Creek (below the pines). The longitudinal range of the species is approximately twenty miles. While thus such a narrow endemic it must be said that in its district it occurs in considerable abundance in many places on the woodland slopes. Above the Mission station, on the railroad easterly from Auberry, the mountain side is whitened with its blossoms during anthesis. Its foliage is bitter and the sheep seldom touch it.

A typical station may be described from field notes as follows: About five miles above Auberry the road swings to the left around the corner of a mountain ranch in a swale and goes on northeasterly up a wooded mountain slope. After about a half mile we chance into a cluster of singular looking shrubs which are noticeable on account of the conspicuous dried remains of their white flowers. The shrubs, about a dozen in number at this spot, are scattered along the bed of a scarcely discernible winter rivulet or shallow gulch. The altitude is about 2600 ft. The slope is rather closely wooded with Quercus wislizenii, Pinus sabiniana, Rhus diversiloba, Aesculus californica, Arctostaphylos mariposa and Umbellularia californica. It is quite obvious on examining the shrubs that we have met with the rare Carpenteria californica. The shrubs are eight to sixteen feet high, with erect stems from near the base. The main stems are one to three inches in diameter. The bark on the main stems is very smooth and is now (July) exfoliating in broad yellow sheets which greatly resemble a somewhat thin, soft and fairly pliable leather almost exactly of a light buckskin color. The shrubs are past anthesis but the inflorescences are still holding many of the persistent petals.

The shrubs are bush-like in form, characteristic fire-chaparral type, many-stemmed from the ground, forming much-spreading individuals in most cases. The leaves are somewhat revolute from both edges, resulting thus in a somewhat narrow leaf from the standpoint of insolation. The leaf, therefore, in its own way, is reduced in area, a common characteristic of typical shrub members of the chaparral belt. The leaves are borne mostly in clusters on the new wood below the inflorescence and hang down, so that this feature imparts a characteristic aspect to this interesting shrub.—Jepson Field Book 47:368–370, ms.

Refs.—CARPENTERIA CALIFORNICA Torr. Pl. Frem. 12, pl. 7 (1853), type loc. Sierra foothills in n. Fresno Co., *Fremont;* Jepson, Man. 466, fig. 461 (1925).

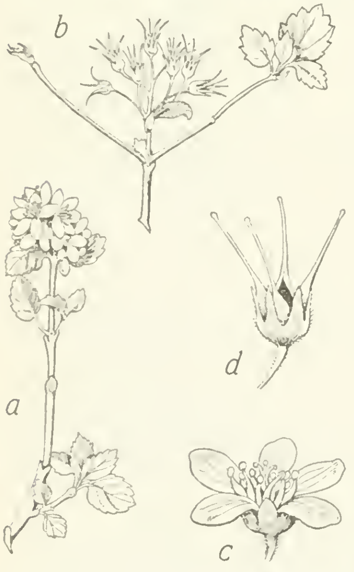

Fig. 155. JAMESIA AMERICANA T. & G. var. CALIFORNICA Jepson. *a*, fl. branchlet, × ½; *b*, fr. branchlet, × ½; *c*, fl., × 2; *d*, fr., × 2.

17. JAMESIA T. & G.

Shrubs with opposite deciduous leaves. Flowers in terminal cymose clusters. Calyx 5-lobed, its tube joined to lower part of the ovary. Petals spreading. Stamens 10, the alternate shorter; filaments dilated. Ovary conical, with 3 to 5 parietal placentae; styles 3 to 5. Capsule incompletely 3 to 5 or 7-celled. Seeds many, striate-reticulate.—Species 1. (Dr. Edwin James, botanist and historian of Long's expedition to the Rocky Mts., 1820.)

1. **J. americana** T. & G. var. **californica** Jepson. CLIFF BUSH. (Fig. 155.) Low shrub ½ to 3 feet high, with shreddy gray or reddish bark, the young parts and calyces pubescent; leaf-blades roundish to ovate, coarsely serrate, green and pubescent above, pale and densely strigose beneath, ½ to 1½ inches long, on short or sometimes long petioles; flowers deep pink; calyx-lobes narrow-ovate, acute, rarely obtuse; petals oblong or obovate, obtuse, 3½ lines long; capsule (including the persistent styles) 5 lines long, surpassing the now lanceolate calyx-lobes.

Granite cliffs and rocky cañon walls, 8500 to 12,000 feet: southern Sierra Nevada on its east slope or easterly crests from Palisade Creek, Fresno Co., to the Kern Cañon and Inyo Co.; Panamint Range. East to Southern Nevada. July.

Locs.—Palisade Creek, Fresno Co.; Heart Lake, nw. Inyo Co., acc. *Peirson;* Vidette Falls, Kings River, *A. J. Perkins;* Kern-Kaweah River, *Jepson* 5019; Kaweah Peaks (Zoe 4:152); White Chief Mine, Sawtooth Range (Contrib. U. S. Nat. Herb. 4:267); near Twin Lakes, Mt. Whitney, acc. *A. J. Perkins;* Little Cottonwood Creek, *J. Grinnell;* Panamint Range (Contrib. U. S. Nat. Herb. 4:99).

Refs.—JAMESIA AMERICANA T. & G. Fl. 1:593 (1840), type loc. Rocky Mts. of Colo., *James;* Engler in Engler & Prantl, Nat. Pflzf. 3^{2a}:71, fig. 36H-M (1890). Var. CALIFORNICA Jepson, Man. 466 (1925). *Edwinia californica* Small, N. Am. Fl. 22:176 (1905), type loc. Volcano Creek Falls, near Kern Cañon, Tulare Co., *Eastwood.* Small's character for the Californian shrub, "Sepals obtuse or retuse; leaf-blades few-toothed, dentate", does not apply, but his character for the Rocky Mt. shrub, "Sepals acute; leaf-blades many-toothed, serrate", applies well to the Sierra Nevada form. The flowers of our form are, however, pink, while those of the Colorado shrub are white.

18. **WHIPPLEA** Torr.

Small low under-shrub with opposite leaves. Flowers small, white, in short cymes on terminal naked peduncles. Calyx-tube adnate to the lower half or third of the ovary, its lobes deciduous. Corolla white. Stamens 10 (or 8 to 12), those opposite the petals somewhat shorter, the filaments all dilated at the base or below the middle. Ovary 3 to 5-celled, with a single suspended ovule in each cell; styles 3 to 5, distinct, subulate, deciduous. Capsule septicidally dehiscent into 3 to 5 cartilaginous 1-seeded portions which open down the ventral suture.—Species 3, western North America. (Lieut. A. W. Whipple, U. S. Army, commander of the Pacific Railroad Expedition from the Mississippi River to Los Angeles in 1853 and 1854.)

Trailing bush; cymes simple, sometimes racemose; capsule globose; Coast Ranges..1. *W. modesta.*
Erect bush; cymes compound; capsule cylindric; e. Mohave Desert..........................2. *W. utahensis.*

1. **W. modesta** Torr. YERBA DE SELVA. (Fig. 156.) Stems slender, diffuse or trailing, 1 to 2 feet long; herbage and calyx-tube pubescent; calyx-lobes glabrous; leaf-blades ovate or oval-ovate, 3-nerved, crenate above the middle, ¾ to 1¾ inches long, short-petioled or subsessile; cymes capitate or somewhat racemose, about 4 to 9-flowered, the flowers soon becoming somewhat greenish; petals oblong or ovate, contracted at base, ¾ to 1¼ lines long, larger than the linear calyx-lobes; capsule globular.

Woods and thickets, 100 to 4000 feet: Coast Ranges from Monterey Co. to Solano Co. and Del Norte Co. North to Oregon. Apr.-June. The trailing stems root freely at the nodes and in time multiplication occurs vegetatively.

Locs.—Cruikshank Creek, s. Santa Lucia Mts., *Condit;* Santa Cruz Mts. betw. Patchin and Soquel, *Pendleton;* Mt. Hermon, *S. E. Anderson;* La Honda, San Mateo Co., *C. F. Baker* 502; Mill Valley, Mt. Tamalpais, *Jepson;* Duncan Mills, *M. S. Baker;* Hoods Peak, *Michener & Bioletti;* Miller Cañon, Vaca Mts., *Jepson* 14,650; Mt. St. Helena, *F. P. McLean;* Scott Valley, Lake Co., *Tracy* 1656; Comptche, Mendocino Co., *H. A. Walker* 244; Red Mt., n. Mendocino Co., *Jepson* 16,521; Bull Creek, Humboldt Co., *Jepson* 16,400; Hy-am-pum, Humboldt Co., *Chesnut & Drew;* Hupa, *Manning;* Adams sta. to Patrick Creek, Del Norte Co., *Jepson* 2914. Parish cites (Erythea 7: 92) a station in San Timoteo Cañon near Redlands, but it has not been reported by others as occurring in Southern California. Cow Creek Mts., s. Ore., *Henderson* 317.

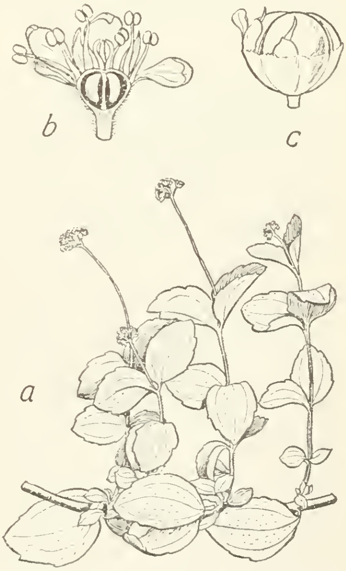

Fig. 156. WHIPPLEA MODESTA Torr. *a,* habit, × ½; *b,* long. sect. of fl., × 4; *c,* fr., × 4.

Refs.—WHIPPLEA MODESTA Torr. Pac. R. Rep. 4:90, pl. 7 (1857), type loc. Marin Co., *Bigelow;* Jepson, Fl. W. Mid. Cal. 272 (1901), ed. 2, 201 (1911), Man. 466 (1925).

2. **W. utahensis** Wats. Yerba Desertio. (Fig. 157.) Stems erect, much-branched, forming a dense bush 4 to 6 inches high, the branches ending in small dense compound cymes; herbage hirsutulose, the old bark whitish; leaf-blades ovate, 3-nerved, 2½ to 3 lines long, on short (¼ line) petioles; flowers 1¼ to 2 lines long; petals oblong or obovate, shortly clawed; stamens 10; styles 2 or 3; capsule oblong.

Rocky cañons, 5000 to 8000 feet: eastern Mohave Desert. East to Utah and Arizona. Aug.

Loc.—Clark Mt., *Edmund Jaeger;* the only known locality in California.

Refs.—Whipplea utahensis Wats. Am. Nat. 7:300 (1873), type loc. Kanab, Utah, *E. P. Thompson. Fendlerella utahensis* Hel. Bull. Torr. Club 25:626 (1898).

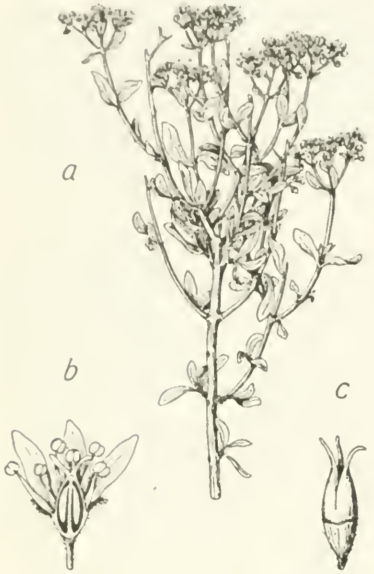

Fig. 157. Whipplea utahensis Wats. *a*, habit, × ½; *b*, long. sect. of fl., × 3; *c*, fr., × 3.

19. **RIBES** L. Gooseberry. Currant

Shrubs, either unarmed or prickly. Leaves alternate, palmately lobed, the stipules adnate or none. Flowers in racemes or solitary, the pedicels with bractlets. Calyx-lobes, petals and stamens 5 in all ours except R. speciosum. Calyx-tube adnate to the 1-celled ovary and more or less produced beyond it. Petals inserted on the throat of the calyx, the stamens alternating with them. Placentae 2, parietal. Style cleft at the summit or halfway, sometimes quite to the base, rarely nearly entire; stigmas terminal. Fruit a berry.—Species about 130, North and South America, Europe, Asia and Mt. Atlas in north Africa. (Ancient Arabic name.)

Bibliog.—Douglas, David, An account of some new and little-known species of the genus Ribes (Trans. Hort. Soc. Lond. 7:508–518, pl. 13,—1830). Gray, Asa, Our wild gooseberries (Am. Nat. 10:270–275,—1876). Coville, F. V., Ribes aureum and Ribes lentum (Proc. Biol. Soc. Wash. 15:23–29,—1902). Eastwood, A., Some new species of Pacific Coast Ribes (Proc. Cal. Acad. ser. 3, Bot. 2:241–254, pls. 23–24,—1902). Heller, A. A., The genus Ribes in California (Muhl. 1:63–104,—1904; 1:133–135,—1906). Janczewski, Edouard de, Monographie des groseilliers, Ribes L. (Mém. Soc. Genève 35:199–516, figs. 1–202,—1907). Church, A. H., Ribes sanguineum (in his Types of Floral Mechanism 1:151–167,—1908). Coville, F. V., & Britton, N. L., Grossulariaceae (N. Am. Fl. 22:193–225,—1908). Jepson, W. L., Studies on Ribes made at Kew (1–41, ms. 1926, 1930).

Geog. note.—In the matter of species differentiation Ribes is much more strongly developed in the Coast Ranges than in the Sierra Nevada. In the latter region the two most abundant species prevailing over a wide area are Ribes roezlii Regel, in the Transition zone, and Ribes cereum Dougl., chiefly in the Canadian and Hudsonian zones. In the Pinus ponderosa belt of the Sierra Nevada Ribes roezlii is very common, and not markedly variable, nor is Ribes cereum especially variable although wide-spread within the Abies magnifica and Pinus albicaulis belts. Nine other species and one variety occur on the west slope of the Sierra Nevada but there are no truly localized species. In contrast with the somewhat continental climate of the Sierra Nevada, we have in the Coast Ranges a large number of minor climatic areas with a corresponding differentiation in species and forms, namely seventeen species and fifteen varieties. Of these certain species and certain varieties are highly localized, such as Ribes victoris Greene and its variety greeneianum Jepson, R. menziesii Pursh with seven localized varieties, R. californicum H. & A., R. sericeum Eastw. and R. marshallii Greene. Regarding the endemic variants of R. menziesii, see the note below under species number 19.

A. Stems unarmed; berry spineless; peduncles bearing a several to many-flowered raceme.—Subgenus Ribesia (Currants).

Flowers yellow; leaves convolute in the bud..1. *R. aureum.*
Flowers red, white, or greenish; leaves plaited in the bud.
Calyx-tube cylindric or campanulate.

Flowers white or greenish-white.

Calyx-tube cylindric, 2½ to 3 times as long as broad; berry crimson....2. *R. cereum.*

Calyx-tube campanulate, 1 to nearly 2 times as long as broad; berry black................ 3. *R. viscosissimum.*

Flowers pink or red.

Calyx-lobes erect in anthesis, the calyx-tube bowl-shaped....................4. *R. nevadense.*

Calyx-lobes rotate or recurving in anthesis.

Style glabrous; leaves thinnish..5. *R. sanguineum.*

Style pubescent; leaves thickish...6. *R. malvaceum.*

Calyx-tube rotately spreading or saucer-shaped; leaves resinous-dotted below.

Leaves maple-like, deciduous.

Stems ascending; ovary with stalked glands..7. *R. laxiflorum.*

Stems erect; ovary with sessile glands...8. *R. bracteosum.*

Leaves leathery, evergreen...9. *R. viburnifolium.*

B. Stems bearing spines at the nodes below the leaves and often prickly; berry spiny or spineless; peduncles mostly 1 to few-flowered.—Subgenus GROSSULARIA (Gooseberries).

Flowers 5-merous; petals much shorter than the calyx-lobes; calyx-lobes reflexed in flower, later erect; stamens exserted or not exserted.

Calyx-tube rotately spreading or saucer-shaped; berry with gland-tipped hairs.

Leaves glabrous or nearly so; berry black...10. *R. lacustre.*

Leaves very glandular-sticky; berry red...11. *R. montigenum.*

Calyx-tube cylindric or campanulate.

Styles hairy; ovary and berry glabrous and spineless.

Stamens longer than the calyx-lobes...12. *R. divaricatum.*

Stamens shorter than the calyx-lobes..13. *R. inerme.*

Styles glabrous.

Berry spineless, sometimes glandular-hairy.

Ovary and berry glabrous.

Calyx-tube 1¼ to 2 times as long as the calyx-lobes........14. *R. leptanthum.*

Calyx-tube ¾ to as long as the calyx-lobes.......................15. *R. quercetorum.*

Ovary and berry more or less hairy...16. *R. velutinum.*

Berry spiny.

Anthers lanceolate to linear, apiculate or constricted at apex; stamens 1⅓ to 2 times longer than the petals.

Calyx-tube much longer than broad.

Berry with very short regular gland-tipped spines; Santa Inez Mts. to San Bernardino Mts...17. *R. amarum.*

Berry with long glandless spines, sometimes also with very short glandular ones; spines glabrous or hairy; bracts borne at apex of the peduncle, covering the ovary; Sierra Nevada and Coast Ranges..18. *R. roezlii.*

Calyx-tube as broad or nearly as broad as long; bracts borne near the middle, or at least distinctly below the apex, of the peduncle, not covering the ovary.

Calyx lurid purple to greenish-white.

Leaves mostly pubescent, and mostly glandular below; ovary with unequal spines, the shorter mostly gland-tipped; mostly of the coast line..............................19. *R. menziesii.*

Leaves glabrous or nearly so and non-glandular; ovary with mostly equal non-glandular bristles..20. *R. californicum.*

Calyx dull white; leaves and especially petioles more or less viscid-glandular; ovary with spines and sometimes also with short-stiped glands; mostly inner Coast Ranges......21. *R. victoris.*

Anthers oval or elliptic, not apiculate at apex.

Stamens twice as long as the petals; calyx crimson or red; berry with subequal spines.

Leaves soft-pubescent, commonly with intermixed short bristly hairs; Monterey coast...22. *R. sericeum.*

Leaves glabrous or nearly so; Humboldt Co. to Siskiyou Co.

Calyx-tube about as broad as long; berry with long glandless spines...23. *R. marshallii.*

Calyx-tube longer than broad; berry with very short glandular spines..24. *R. lobbii.*

Stamens scarcely exceeding the petals; calyx greenish-white; berry with very unequal spines; leaves pubescent............25. *R. binominatum.*

Flowers 4-merous, red, showy; petals as long as the calyx-lobes; calyx-tube short, swollen into a ring or annulation, its lobes erect; stamens long-exserted.........................26. *R. speciosum.*

1. **R. aureum** Pursh. Golden Currant. Shrub 4 to 8 feet high, nearly glabrous, not glandular; leaf-blades ½ to 1⅛ inches wide, 3 to 5-lobed, mostly obtuse or truncate at base, the lobes rounded, entire or few-toothed or incised; racemes about 1 inch long, loose, with few to several flowers, the bracts foliaceous; flowers golden yellow, spicy-fragrant; calyx-tube slender, 2 to 3 times the length of the oval calyx-lobes; calyx-lobes rotate, 1½ to 2 lines long; stamens not surpassing the petals; ovary glabrous; berry yellow, crimson or black, 2 to 3 lines long.

Moist land or banks of streams or lakes, 2600 to 4700 feet: east and north of the Sierra Nevada crest, especially on the interior plateau of northeastern California. North to British Columbia and east to the Rocky Mts. Apr.-May. Also called Soldier Berry.

Locs.—Mayten, Siskiyou Co., *Alexander & Kellogg;* Yreka, *Butler* 266, 598; Egg Lake, *M. S. Baker;* Ft. Bidwell, *Manning;* Alturas, *Goldsmith;* Amedee, Lassen Co., *Davy* (leaves 1 to 2 inches wide); Nelson Range, Inyo Co.

Var. **gracillimum** Jepson. Flowers scentless, soon aging deep red; calyx-tube more slender and calyx-lobes shorter (1 to 2 lines long); petals narrowly elliptic and denticulate.—Valley floors and cañon flats or hillsides, 800 to 2300 feet: South Coast Ranges from Contra Costa Co. to San Luis Obispo Co. and south to western Riverside Co. Feb.-May.

Locs.—Wild Cat Creek and Niles (Greene, Man. Reg. S. F. Bay, 124); San Antonio Valley, Mt. Hamilton Range, *Vaslit;* Priest Valley, San Carlos Range, *Jepson* 2668; Templeton, *Pearl C. Jared;* San Fernando Valley, *Parish* 1948; Glendora, *C. F. Baker* 4154; Riverside.

Refs.—Ribes aureum Pursh, Fl. 1:164 (1814), type from n. Rocky Mt. region, *Lewis;* Lindl. Bot. Reg. t. 125 (1816); Jepson, Man. 468 (1925). *R. tenuiflorum* Lindl. Trans. Hort. Soc. Lond. 7:242 (1830), type collected in n. Rocky Mts., *Lewis;* Bot. Reg. t. 1274 (1829). *R. aureum* var. *tenuiflorum* Torr. Pac. R. Rep. 4:88 (1857). Var. gracillimum Jepson, Man. 468 (1925). *R. gracillimum* Cov. & Britt. N. Am. Fl. 22:205 (1908), type loc. Stanford, *Elmer* 3025. *R. aureum* var. *tenuiflorum* Jepson, Fl. W. Mid. Cal. 273 (1901), ed. 2, 201 (1911).

2. **R. cereum** Dougl. Sheep Currant. Broad much-branched bush, usually low, 1 to 3 or 7 feet high; foliage pleasantly but somewhat heavily fragrant; leaves minutely glandular and glandular-dotted, sometimes also puberulent, ¾ to 1 inch (less commonly ½ to 1¼ inches) wide, shallowly 3 (or 5) -lobed or cleft, the lobes serrate or incised; racemes drooping, 2 to 9-flowered; flowers 4 to 5 lines long; calyx white or pinkish, tubular, its short lobes rotate, white; petals white, very small, the blade transversely oblong with a very short broad claw; stamens included, with very short filaments, inserted high on the tube; berries crimson, glabrous, glandular or with minute gland-tipped hairs, 3 lines in diameter.

High montane, 5000 to 12,050 feet: Sierra Nevada and south to Mt. Pinos and the San Gabriel, San Bernardino and San Jacinto mountains. East to the Rocky Mts., north to British Columbia. June-Aug. Also called Squaw Currant and Wax Currant.

Geog. note.—Throughout the western United States Ribes cereum has a wide geographic range in the high montane country. Its altitudinal range may also be remarked. At the Feather River Meadows where the wagon road comes down the ridge as one travels easterly from Mill Creek and Morgan, it grows at about 5000 feet; on Mt. Whitney it occurs up to 12,000 feet and is the last shrub found as one ascends that mountain. The foliage is mostly or nearly glabrous, though sometimes it is puberulent or glandular-puberulent. Save for this the species is remarkably constant in its gross features, notwithstanding its area of distribution is characterized by marked diversity of climate and habitat.

Locs.—Mt. Shasta (N. Am. Fauna, 16:148); Egg Lake, Modoc Co., *M. S. Baker;* Mt. Bidwell, *Jepson* 7860, 7876; Eagle Peak, Warner Mts., *Jepson* 7958; Dixie Mts., Lassen Co., *M. S. Baker;* Prospect Mt., Lassen Co., *J. Grinnell;* Cinder Cone, Lassen Co., *Jepson* 4118; Feather River Mdws. near Rice Creek, *Jepson* 12,280; Wilson Lake, Plumas Co., *J. Grinnell;* Truckee, *Sonne* 20; Mt. Tallac, *Pendleton & Reed* 1100; White Wolf Mdw., Tuolumne Co., *A. L. Grant* 1285; Sonora Peak, *A. L. Grant* 396; Mt. Dana, *Jepson* 3294; Bloody Cañon, Mono Co., *Jepson* 4458; Tamarack Creek, Fresno Co., *Wieslander;* Bench Mdw., Kaiser Ridge, *Jepson* 13,278; Kearsarge Pass, *Jepson* 862; Harrison Pass, *Jepson;* Mt. Whitney, *Burton & Ryerson;* Kern Cañon, *Jepson* 969, 1107; Big Arroyo, Kern Cañon, *Jepson* 4991; Mt. Silliman, *Jepson* 726; Mineral King, *Jepson* 1026; North Fork Middle Tule River, *Jepson* 4698; Sheep Mt., White Mts., *Jepson* 7310; Silver Cañon, White Mts., *Jepson* 7200, the berries now edible (July, 1917) and the chief food of chipmunks and chickadees; Mt. Pinos, *J. Grinnell* 28; Devils Punch Bowl, San Gabriel Mts., *Peirson* 516; North Baldy, San Gabriel Mts., *Peirson* 256; Dry Lake, San Bernardino Mts., *J. Grinnell* 1; Mt. San Jacinto, *Jepson* 2320; Santa Rosa Peak, *Jepson* 1450.

Refs.—RIBES CEREUM Dougl. Trans. Hort. Soc. 7:512 (1830), type loc. upper Columbia River, *Douglas;* Lindl. Bot. Reg. t. 1263 (1829); Jepson, Man. 468, fig. 462 (1925). *R. balsamiferum* Kell. Proc. Cal. Acad. 2:94, fig. 25 (1861), type loc. Washoe, Nev., *J. A. Veatch.* Var. *viridescens* Jancz. Mém. Soc. Genève 35:338 (1907), the foliage greener and less glandular.—Colo. and Cal. (Sierra Nevada).

3. **R. viscosissimum** Pursh. MOUNTAIN CURRANT. Leafy shrub 1 to 3 feet high with reddish shreddy bark and fragrant foliage; herbage glandular-hispidulose and also puberulent, especially on the branchlets and petioles; leaf-blades cordate-rounded, shallowly 3-lobed with rounded lobes and open sinuses, crenate, 1½ to 2½ inches broad; racemes ascending, short, somewhat corymb-like, 3 to 13-flowered; bracts oblong, conspicuous; flowers 8 lines long; pedicels 2 to 5 lines long; calyx greenish or pinkish, its tube nearly as broad as long, its oblong lobes at least half the length of the tube; petals dull white, broadly ovate, very obtuse, their tips approximate and so narrowing the opening a little; stamens not exceeding the petals; ovary covered with gland-tipped hairs; berry black, more or less glandular-bristly.

High mountains, 8000 to 9500 feet: Sierra Nevada from Tulare Co. to Mariposa Co.; eastern Modoc Co. East to the Rocky Mts. and north to British Columbia. June-July.

Locs.—Hockett Mdw., Little Kern River, *Culbertson* 4383; Wilsonia, Grant Park, *Newlon* 217; Kaweah Mdws., Sequoia Park, *Purpus* 1464; Huntington Lake, *A. L. Grant* 1027; McClure Fork Merced River, *Jepson* 3220; betw. White Wolf Mdw. and Harden Lake, Tuolumne Co., *A. L. Grant* 1274; Pine Creek basin, Warner Mts., *Frances Payne* 50.

Var. hallii Jancz. Calyx purple-tipped; ovary glabrous; berry glabrous, with a bloom.—Sierra Nevada from Mariposa Co. northward to Mt. Shasta, thence west into the far North Coast Ranges. This is a fairly well-marked geographic variety, but there are intermediate states in the region where the variety and species meet. For example a collection from Matterhorn Cañon, Yosemite Park, *Jepson* 4498, is such a transition form; in these spms. glabrous and gland-tipped ovaries occur on the same branchlet; while one may also find flowers on a given branchlet, some with white, others with purple calyx-lobes. The following are fairly typical of the variety: Glen Alpine, Eldorado Co., *Pendleton & Reed* 1060; Summit sta., Nevada Co., *Jepson* 13,505; Truckee, *Sonne* 59; Webber Lake, *Doten;* Alturas, *Goldsmith;* Mill Cañon, ne. Modoc Co., *Manning;* Medicine Lake, *M. S. Baker* 472; Ash Creek, Mt. Shasta, *M. S. Baker;* Shackelford Cañon, w. Siskiyou Co., *Jepson* 2821; Cold Spring Camp, Woolly Creek, w. Siskiyou Co., *Butler* 260; Jackson Lake, Siskiyou Co., *Alexander & Kellogg* 148; Trinity Summit, *Jepson* 2037.

Refs.—RIBES VISCOSISSIMUM Pursh, Fl. 1:163 (1814), type loc. Lolo Trail, Bitterroot Mts., Ida., *Lewis* (cf. Piper, Contrib. U. S. Nat. Herb. 11:326,—1906); Hook. Fl. Bor. Am. 1:234, t. 76 (1834); Jepson, Man. 469 (1925). Var. HALLII Jancz. Mém. Soc. Genève 35:328, fig. 62 (1907). *R. hallii* Jancz. Bull. Intern. Acad. Sci. Crac. 1906:9, type loc. Lake Independence, *Hall & Babcock* 4533 (not 5533), 4320 (not 4370).

4. **R. nevadense** Kell. SIERRA CURRANT. Slender diffuse or erect shrub 3 to 6 feet high; foliage and racemes similar to R. glutinosum, but the flowers very much shorter; calyx reddish, 1 to 2 lines long, its tube short and broad, almost bowl-shaped, its lobes erect; petals white, slightly shorter than the calyx-lobes; style very short; berry blue-black but covered with a white bloom.

Higher mountains, 3600 to 7100 feet: North Coast Ranges from Trinity Co. to Siskiyou Co.; Sierra Nevada from Shasta Co. to Tulare Co.; south to the San Gabriel, San Bernardino and San Jacinto mountains. May-July.

Locs.—Grizzly Creek, Trinity Co., *Alexander & Kellogg* 275; Shackelford Creek, w. Siskiyou Co., *Butler* 1759; Jackson Lake, Siskiyou Co., *Alexander & Kellogg* 164; Mt. Shasta, *Jepson* 13,520 (leaves minutely glandular-dotted beneath); Goose Valley, Shasta Co., *M. S. Baker;* Manzanita Lake, Lassen Peak, *Jepson* 15,290; Rich Point, Middle Fork Feather River, *Jepson* 10,617; Bear Valley, Nevada Co., *Jepson* 13,521; Glen Alpine, Eldorado Co., *Pendleton & Reed* 1061; Kyburz, South Fork American River, *Ramaley* 11,268; Antelope, Amador Co., *Hansen* 1690; Calaveras Big Trees, *A. L. Grant;* Hetch Hetchy, *Jepson* 3473 (a form of a dry situation); Peregoy Mdw., Yosemite Park, *A. L. Grant* 1305; Bench Mdw., Kaiser Ridge, *Jepson* 13,277 (sheep do not browse it in this district); Marble Fork Kaweah River, *Jepson* 692; Garfield Forest, Sequoia Park, *Jepson* 4671; Mt. Wilson, *Peirson* 72; San Bernardino Mts. (Fish Creek, *J. Grinnell*, Mill Creek Cañon, *Jepson* 5585); Strawberry Valley, Mt. San Jacinto, *Jepson* 1306; Tahquitz Valley, Mt. San Jacinto, *F. M. Reed* 2309.

Refs.—RIBES NEVADENSE Kell. Proc. Cal. Acad. 1:63 (1855), ed. 2, 1:65 (1873), type loc. above Placerville, *E. W. Garvett* (cf. Bull. N. Y. Bot. Gard. 6:367); Jepson, Man. 469 (1925). *R. malvaceum* Kell. l.c. 46, not Smith. *R. sanguineum* var. *variegatum* Wats. Bot. King 100 (1871), type loc. Washoe Mts. near Carson City, Nev., *Watson* 381. *R. ascendens* Eastw. Proc. Cal. Acad. ser. 3, Bot. 2:244, pl. 23, figs. 4a, 4b (1902), type loc. Millwood, Fresno Co., *Eastwood*. *R. ascendens* var. *jasperae* Eastw. l.c. pl. 23, fig. 5, type loc. San Emigdio Cañon, Kern Co., *Jasper*. *R. hittellianum* Eastw. l.c. 245, pl. 24, figs. 6a, 6b, type loc. Cañon Creek, Trinity Co., *Eastwood*. *R. glaucescens* Eastw. l.c. pl. 24, figs. 7a, 7b, type loc. Mt. Shasta, *Eastwood*. *R. grantii* Hel. Muhl. 4:27 (1908), type loc. Mt. Wilson, *Geo. B. Grant* 6241.

5. **R. sanguineum** Pursh. Blood Currant. Shrub 4 to 9 feet high, the stems slender, erect or spreading; bark brownish, shreddy; foliage sticky when young; leaf-blades roundish-cordate in outline, 3-lobed or with 2 supplementary lobes, rather finely serrate, 1½ to 3 inches broad, green above, pale pubescent or tomentulose beneath; racemes erect, rather long-peduncled; bracts crimson; flowers blood-red, 6 to 7 lines long; calyx funnelform, its tube shorter than the lobes; petals short-spatulate; ovary sprinkled with short stipitate glands, otherwise glabrous, rarely puberulent; berry blue-black, with bloom, 4 to 5 lines in diameter.

Montane, 2000 to 6000 feet: northwestern Lake Co.; northern Humboldt Co.; Siskiyou Co. North to British Columbia. Apr.-June.

Locs.—N. Humboldt Co., on the Klamath River, *Goddard* 159; Marble Mt., *Jepson* 2822; Shackelford Creek, Siskiyou Co., *Butler* 258, 262; Quartz Valley, Siskiyou Co., *Butler* 671; Pine Mt., nw. Lake Co., *Purpus* 1041. Elk Lake, B. C., *Pineo*. The plants at the Joaquin Spr., Mt. Hamilton (*Jepson* 4217), are intermediate with the variety glutinosum, having blood-red flowers and perfectly glabrous ovaries but drooping racemes.

Var. **glutinosum** Loud. Winter Currant. Similar to the species; racemes drooping; flowers deep or pale pink.—Common in cañons or on northward slopes near the coast, 50 to 2000 feet: San Luis Obispo Co. to the Berkeley Hills and Mt. Tamalpais and northward to Del Norte Co. Jan.-Apr. The berries when full ripe are soft and bland but not at all sweet. At the time of mature fruit the foliage possesses a marked aroma or nutmeg odor.

Locs.—Arroyo Grande, *Brewer* 431; Los Gatos, *Bioletti;* Saratoga, *Heller;* Lake Merced, San Francisco, *Jepson;* Berkeley, *Jepson* 9800; Ross Valley, Marin Co., *Jepson* 13,500; Olema, *Jepson;* Inverness, *Jepson* 502; Seaview, Sonoma Co., *M. S. Baker;* Eureka, *Tracy* 2948; Lawrence Creek, Humboldt Co., *Tracy* 6960; Redwood Creek, Humboldt Co., *Jepson* 1972; Smith River, *Goddard*.

Var. **melanocarpum** Jepson comb. n. Berries black.—Cañons in the low hills about San Francisco Bay: Berkeley, *Jepson* 9801; Santa Clara Co. acc. *Greene*. The berries when full ripe are soft and a little sweet. The foliage is without aroma.

Var. **deductum** Jepson. Six to 16 feet high; leaves thin; flowers very pale or whitish, few in a mostly loose drooping raceme; berry ripening slowly.—Very dense shade of woods: San Mateo Co.; Berkeley; Eureka.

Refs.—RIBES SANGUINEUM Pursh, Fl. 1:164 (1814), type from the Columbia River, *Lewis;* Lindl. Bot. Reg. t. 1349 (1830); Douglas, Trans. Hort. Soc. Lond. 7:509, pl. 13 (1830); Jepson, Man. 469 (1925). *R. scuphami* Eastw. Proc. Cal. Acad. ser. 3, Bot. 2:242, figs. 1a, 1b (1902), type loc. Smith River, *J. R. Scupham*. Var. GLUTINOSUM Loud. Arb. 988 (1838); Jepson, Fl. W. Mid. Cal. 273 (1901), ed. 2, 202 (1911), Man. 469, fig. 465 (1925). *R. glutinosum* Benth. Trans. Hort. Soc. ser. 2, 1:476 (1835), type from Cal., *Douglas*. Var. MELANOCARPUM Jepson. *R. glutinosum* var. *melanocarpum* Greene, Man. Reg. S. F. Bay 124 (1894), "Berkeley and Santa Clara Co." Var. DEDUCTUM Jepson, Man. 469 (1925). *R. deductum* Greene; Jancz. Mém. Soc. Genève 35:320 (1907), type loc. Crystal Springs Lake, San Mateo Co., *C. F. Baker* 441.

6. **R. malvaceum** Sm. California Black Currant. Stems stout, usually many from the base, forming a strictly erect and compact bush 4 to 6 feet high; leaf-blades shallowly or somewhat deeply 3-lobed, thick, conspicuously rugulose, slightly glandular-scabrous above, more or less white-tomentulose beneath, ¾ to 2¾ inches broad; racemes drooping; flowers rose-color, very pale pink, or whitish, 4 to 5 lines long; calyx-tube broadly cylindric, longer than the rotate or spreading lobes; petals very broad, truncate; ovary white-hairy and with short gland-tipped hairs; berry ripening rapidly, glaucous, somewhat hispidulous or hairy.

Wooded or dry open hills, 400 to 2500 feet: inner Coast Range from Tehama Co. to Mt. Diablo, thence west to Marin Co. and south to coastal Southern California. Dec.-Apr.

Locs.—Greasewood Hills, Tehama Co., *Jepson* 13,502; Elk Creek (6 mi. w.), Glenn Co., *Guy Smith;* Gates Cañon, Vaca Mts., *Jepson* 13,503; North Berkeley hills, *Jepson* 13,526, 13,527; Las Trampas Ridge, *Jepson* 9844; Mt. Diablo, *Jepson* 9514; Smith Creek, Santa Clara Co., *R. J. Smith;* Los Gatos, *Heller* 7219; San Luis Obispo Co., *Ida Blochman;* Santa Barbara, *Jepson* 9165; Ojai Valley, *Olive Thacher* 17; Cahuenga Pass, *Brewer* 183; Santa Monica, *Barber;* Arroyo Seco, Los Angeles Co., *Braunton* 774; San Bernardino, *Parish* 3629; San Miguel Mt., San Diego Co., *Chandler.*

Var. **viridifolium** Abrams. Foliage greener than in the species and inflorescence more glandular; flowers 5 to 6½ lines long.—Montane, 3000 to 5000 feet: San Bernardino Mts.; San Gabriel Mts. (ridge betw. Monrovia and Fish cañons, *Peirson* 71).

Var. **indecorum** Jancz. Leaves darker and smaller than in the species; racemes short; flowers whitish, nearly sessile, 2½ to 3½ lines long; style very short.—A form of the dry chaparral belt of Southern California from Santa Barbara Co. to San Diego Co.: Painted Cave Ranch, Santa Barbara Co., *Eastwood* 60; Arroyo Seco, San Gabriel Mts., *Peirson* 299, 299a; Potrero, San Diego Co., *Abrams* 3551; Campo, *Newlon* 354. On Cedar Mt., se. Alameda Co., *Jepson* 6216, it recurs as an intergrade to *R. malvaceum.*

Refs.—RIBES MALVACEUM Sm.; Rees, Cycl. 30, Ribes n. 13 (1819), type from Cal., *Menzies;* Jepson, Fl. W. Mid. Cal. 273 (1901), ed. 2, 202 (1911), Man. 470 (1925). *R. sanguineum* var. *malvaceum* Loud. Arb. 988 (1838). *R. tubulosum* Esch. Mem. Acad. Sci. St. Petersb. 10:283 (1826), type from Cal., *Eschscholtz,* perhaps belongs here. Var. VIRIDIFOLIUM Abrams, Bull. S. Cal. Acad. 1:67 (1902), type loc. Wilsons Peak, *Abrams* 1525; Jepson, Man. 470 (1925). *R. viridifolium* Hel. Muhl. 1:77 (1904). *R. purpurascens* Hel. Muhl. 4:29 (1908), type loc. n. slope San Bernardino Mts., *Parish* 5564. Var. INDECORUM Jancz. Mém. Soc. Genève 35:325 (1907); Jepson, Man. 470 (1925). *R. indecorum* Eastw. Proc. Cal. Acad. ser. 3, 2:243 (1902), type loc. Cajon Heights, San Diego, *Eastwood.*

7. **R. laxiflorum** Pursh. WESTERN BLACK CURRANT. Stems decumbent or ascending, 3 to 8 feet long; leaf-blades roundish-cordate in outline, nearly glabrous above, pubescent beneath, 2½ to 5 inches broad, 5-lobed, or 3-lobed with 2 supplementary lobes at base, serrate; racemes erect, 1½ to 4 inches long; pedicels 2½ to 6 lines long; bracts lanceolate; flowers purplish; calyx saucer-shaped, 3 to 3½ lines broad; petals minute, fan-shaped, truncate or retuse, short-clawed; ovary, pedicels and rachis whitish-pubescent, the former densely, the latter two lightly sprinkled with long-stalked glands; berry black, 2 to 3 lines long, with a few long-stalked glands.

Wet places in woods, 10 to 200 feet: Humboldt Co. North to British Columbia and Alaska. Siberia. Apr.

Habitat note.—Growing in cold wet bottoms in the coastal woods, the stems do not make a definite bush, but trail or climb over stumps or logs. In this manner it often covers areas 20 or more feet across, not rising more than two or three feet above the ground or the supporting undergrowth.—Jos. P. Tracy.

Locs.—Ryan Slough, Eureka, *Tracy* 4890. Juneau, Alas., *Jepson* 480.

Refs.—RIBES LAXIFLORUM Pursh, Fl. 731 (1814), type loc. "Northwest Coast", *Menzies;* Jepson, Man. 470 (1925).

8. **R. bracteosum** Dougl. STINK CURRANT. Tall erect shrub 4 to 8 or 14 feet high; leaf-blades large, deeply 5-lobed with doubly serrate divisions, 2 to 8 or 10 inches broad, nearly glabrous but the upper side minutely strigulose, the under side sprinkled with resin dots; petioles long; racemes erect, 5 to 7 inches long, with numerous (30 or more) greenish-white flowers; bracts persistent, filiform or lanceolate, the lower petioled; calyx rotately expanding or saucer-shaped, 3 to 4 lines wide; petals minute; stamens very short; berry black, covered with a bloom, resin-dotted, 4 lines long.

Stream banks and bottoms along the coast: Mendocino Co. to Del Norte Co. North to Oregon and Alaska. May-June. Also called Skunk Currant.

Locs.—Ft. Bragg, *W. C. Mathews* 56; Cottonaby Creek, Mendocino Co., *Bolander* 6570; Camp Grant, Humboldt Co., *Davy* 5504; Little River, Humboldt Co., *Tracy* 3216; Box Camp, Trinity Summit, *Davy* 5761; Quartz Creek, Del Norte Co., *Jepson* 2893. Orca, Alaska, *Jepson* 453.

Refs.—RIBES BRACTEOSUM Dougl.; Hook. Fl. Bor. Am. 1:233 (1834), type loc. Columbia River mouth, *Scouler & Douglas*; Jepson, Man. 470 (1925).

9. **R. viburnifolium** Gray. ISLAND GOOSEBERRY. Evergreen straggling bush; leaf-blades glabrous, leathery, oval, rounded at apex or sometimes retuse, entire or sparsely crenate, ¾ to 1½ inches long, sprinkled beneath with resin dots; racemes erect; pedicels filiform, 2 to 5 lines long; calyx rotate, pink, 2½ to 3 lines wide; petals minute, ¼ as long as the calyx-lobes; stamens very short; berry oval, glabrous, 3 lines long.

Rocky cañons, frequent on moist north slopes: Santa Catalina Island. Also in Lower California. Jan.

Locs.—Ribes viburnifolium Gray is well-known on Santa Catalina Isl. (*Jepson* 3055), but has never been reported by Californian collectors from Santa Cruz Isl., which is cited as a station by Janczewski (Mém. Soc. Genève 35:341). This is perhaps a slip since he does not cite the former station.

Refs.—RIBES VIBURNIFOLIUM Gray, Proc. Am. Acad. 17:202 (1882), type loc. All Saints Bay, L. Cal., *Parry, Pringle, Jones*; Trask, Erythea 7:141 (1899); Skan, Bot. Mag. t. 8094 (1906); Jepson, Man. 470 (1925).

10. **R. lacustre** Poir. SWAMP GOOSEBERRY. Stems prostrate or ascending, 3 to 4 feet long; spines at the nodes ascending or suberect, mostly 5 to 9, the lateral pair often small, the stems prickly or sometimes naked; leaf-blades nearly or quite glabrous, ¾ to 2¼ inches broad, deeply and incisely 3 or 5-lobed with mostly open sinuses, the lobes incised and serrate; racemes at first erect, later recurving, 1 to 2 inches long, with 7 to 12 greenish flowers on pedicels 2 to 3 lines long; calyx saucer-shaped; stamens about the length of the petals, minute; ovary with scattered gland-tipped prickles, otherwise glabrous; berry black, 2 lines broad, with weak gland-tipped bristles.

Cold wet mountain meadows, 5000 to 6000 feet: North Coast Ranges from Humboldt Co. to Siskiyou Co. North to Alaska, east to New England. June-July.

Locs.—Trinity Summit, *Jepson* 2030; Union Creek, Salmon Mts.; Marble Valley, Marble Mt., *Butler* 263.

Refs.—RIBES LACUSTRE Poir. Encyc. Suppl. 2:856 (1811), type loc. Lake Mistassini, Canada; Hooker, J. D., Bot. Mag. t. 6492 (1880); Jepson, Man. 470 (1925). *R. oxyacanthoides* var. *lacustre* Pers. Syn. Pl. 1:252 (1805).

11. **R. montigenum** McCl. CLOUD-CAP GOOSEBERRY. Low or straggling, much branched bush 1 to 2 feet high, the stems with 1 to 3 or 4 spines at the nodes, the internodes bristly-prickly or nearly naked; herbage short-pubescent, glandular-sticky; leaf-blades small (4 to 8 lines broad), 3 to 5-parted, the lobes incised; flowers reddish-brown; peduncles short; racemes 5 to 7-flowered, the pedicels very short, ¾ to 1⅓ lines long; calyx greenish, fading pinkish, its tube saucer-shaped, 2½ to 3 lines broad; petals dull crimson or deep red, fan-shaped, ⅓ line long; stamens inserted in the sinuses of the glandular 5-lobed disk, very short; ovary hairy, with glandular bristles intermixed; berry light red with weak scattered gland-tipped or rarely glandless bristles or sometimes smooth, 2½ to 3 lines in diameter, slightly acid, palatable.

Dry slopes on the high mountains, 7500 to 12,500 feet: Sierra Nevada from Tehama Co. to Fresno Co.; south to the San Gabriel, San Bernardino and San Jacinto mountains. East to the Rocky Mts., north to British Columbia. July.

Locs.—Brokeoff Mt., Tehama Co., *J. Grinnell*; Summit, Nevada Co., *Bolander*; Tinker Knob, *Sonne*; Mt. Tallac, *Jepson* 8135; Carson Pass, *Jepson* 8114; Sonora Pass, *Jepson* 6577; White Wolf Mdw., Tuolumne Co., *A. L. Grant* 1280; Mt. Lyell, *Jepson* 3346; McClure Fork Merced River, *Jepson* 4429c; Echo Creek, Merced River, *Jepson* 3179; Eagle Mdw., Yosemite, *A. L. Grant* 372; Kaiser Peak, *A. L. Grant* 1012; Nellie Lake, Fresno Co., *Newlon*; Kearsarge Pass, *Jepson* 858; Harrison Pass, *Jepson*; Mt. Whitney, *Jepson* 1096; Mt. Pinos, *J. Grinnell* 27; Mt. San Antonio, *Peirson* 73, 685; Mt. San Jacinto, *Hall* 2410.

Refs.—RIBES MONTIGENUM McCl. Erythea 5:38 (1897); Jepson, Man. 470, fig. 466 (1925). *R. nubigenum* McCl. Erythea 2:80 (1894), type loc. Mt. San Antonio, *McClatchie;* not R. nubigenum Philippi (1856). *R. lacustre* var. *molle* Gray, Bot. Cal. 1:206 (1876), type from the n. Sierra Nevada. *R. molle* Howell, Fl. Nw. Am. 209 (1898). *R. lacustre* var. *lentum* Jones, Proc. Cal. Acad. ser. 2, 5:681 (1895), type loc. Bromide Pass, Henry Mts., Utah, *Jones. R. lentum* Cov. & Rose, Proc. Biol. Soc. Wash. 15:28 (1902).

12. **R. divaricatum** Dougl. STRAGGLE BUSH. Shrub 4 to 6 feet high, with very long straggling branches; bark whitish or dull gray; herbage glandular when young; spines at the nodes 1, sometimes 3; leaf-blades green and minutely pubescent above, pubescent or puberulent and usually pale beneath, ¾ to 1½ (or 2¼) inches broad, 3 to 5-cleft, truncate or subcordate at base, rarely rounded; racemes drooping, loosely 3 to 5-flowered, sometimes 2 or 6-flowered; pedicels 3 to 4 lines long, with a small roundish bract at base; flowers 2½ to 4 lines long; calyx characteristically pilose, its tube ½ to 1½ lines long, its lobes broadly oblong, obtuse, green without, dull purple within, longer than the bowl-shaped tube; petals white, fan-shaped, plane, ¾ to 1 line long; stamens and style exserted, the latter deeply cleft, densely long-villous at the middle; ovary and berry glabrous and spineless; berry subglobose, 2½ to 3½ lines in diameter.

Shaded cañon bottoms and flats, 20 to 2000 feet: Coast Ranges from Humboldt Co. to Ventura Co. North to British Columbia. Apr.

Tax. note.—While in California plants the calyx is thinly hairy, in British Columbia and Washington, on the other hand, the calyx is usually glabrous. This glabrous form rarely reappears in California, as at Samoa near Eureka (*Tracy* 1027).

Locs.—Blue Slide, Van Duzen River, Humboldt Co., *Tracy* 6943; Potter Valley, Mendocino Co., *Purpus* 911; Cobb, Lake Co., *M. S. Baker* 2322a; Lower Lake, Lake Co., *Chandler;* Forestville, Sonoma Co., *M. S. Baker* 21; Olema, Marin Co., *Jepson* 4035; Berkeley, *Jepson* 9598; Lafayette, Contra Costa Co., *Davy* 997; Coyote Hills, Alameda Co., *Bioletti;* Carmel River, Monterey Co., *Heller* 6523; Arroyo Grande, San Luis Obispo Co., *Alice King;* Carpinteria, Ventura Co., *Brewer* 252 (intergrade to var. parishii Jepson).

Var. **parishii** Jepson comb. n. Branchlets covered with a close dense felt; leaves pubescent, silky on the under side when young; calyx reddish, 3½ to 5 lines long; petals red.—Wet places, San Bernardino Valley. Apr.

Refs.—RIBES DIVARICATUM Dougl. Trans. Hort. Soc. 7:515 (1830), type loc. "Northwest Coast", 45° to 52° n. lat., *Douglas;* Lindl. Bot. Reg. t. 1359 (1830); Jepson, Fl. W. Mid. Cal. 273 (1901), ed. 2, 202 (1911); Man. 471, fig. 467 (1925). *R. villosum* Nutt.; T. & G. Fl. 1:547 (1840), type loc. Santa Barbara, *Nuttall. R. divaricatum* var. *montanum* Jancz. Mém. Soc. Genève 35:391 (1907), type loc. Snow Mt.; flowers glabrous (ex char.). Var. PARISHII Jepson. *R. parishii* Hel. Muhl. 1:134 (1904), type loc. Warm Creek, San Bernardino Valley, *S. B. & W. F. Parish. Grossularia parishii* Cov. & Britt. N. Am. Fl. 22:224 (1908). The var. *amictum* Jepson, Man. 471 (1925), lapsus calamus typographicus, due to inadvertent transfer of matter, is false and meaningless.

13. **R. inerme** Rydb. WHITE GOOSEBERRY. Stems slender, often simple, 2 to 5 feet high, prickles none, or rarely a few; bark whitish; spines at nodes 1 to 3, short (1 to 2 lines long) or none; leaf-blades quite glabrous or sparingly pubescent especially beneath, 1 to 2 inches broad, subcordate, 5-cleft, the lobes incisely toothed; petioles usually with a few scattered bristles; flowers 1 to 3, nodding, greenish or purplish, 3 lines long; calyx characteristically glabrous, its tube about as long as the lobes; stamens twice as long as the minute petals; style villous below the middle; ovary glabrous; berry smooth, glabrous, dark purple, 4 lines in diameter.

Mountains, 3500 to 10,600 feet: Sierra Nevada from Tulare Co. to Modoc Co.; eastern Mendocino Co. to Siskiyou Co. East to the Rocky Mts. and north to British America. May.

Locs.—Mineral King, Tulare Co., *Jepson* 1027; Heart Lake, nw. Inyo Co., acc. *Peirson;* Kennedy Mdws., upper Stanislaus River, *Jepson* 6543; Bloody Cañon, Mono Co., *Chesnut & Drew;* Deer Park, Placer Co., *Helen Geis* 50; Little Truckee River, *S. B. Doten* 51; Pine Creek, Lassen Co., *Nutting;* Twelve-mile Creek, e. of Mt. Bidwell, *Manning;* Warner River, Modoc Co., *Manning* 96; Taylor Creek, Forestdale, Modoc Co., *M. S. Baker* 546; Goose Valley, Shasta Co., *M. S. Baker;* Yreka Creek, Siskiyou Co., *Butler* 1362; Potter Valley, Mendocino Co., *Purpus* (leaves a little more pubescent than usual).

Var. **klamathense** Jepson. Leaves villous; calyx thinly hirsute; berry black.—Humboldt Co. to Siskiyou Co.: Twin Valleys, Shasta Co., *M. S. Baker* 295; Goose Valley, Shasta Co., *Nutting;* Yreka, *Butler* 641, 1160; Sisson, Siskiyou Co., *Jepson* 13,509; Hupa, *Chandler* 1320. North to southern Oregon. The following are intergrades towards R. divaricatum Dougl.: Hupa, Humboldt Co., *Manning;* Buck Mt., Humboldt Co., *Tracy* 2767.

Refs.—RIBES INERME Rydb. Mem. N. Y. Bot. Gard. 1:202 (1900), type loc. Slough Creek, Yellowstone Park, *Tweedy* 830; Jepson, Man. 471 (1925). *Grossularia inermis* Cov. & Britt. N. Am. Fl. 22:224 (1908). *R. oxyacanthoides* var. *saxosum* Cov. Contrib. U. S. Nat. Herb. 4:100 (1893). *R. oxyacanthoides* var. *nevadense* Jancz. Mém. Soc. Genève 35:387 (1907), type loc. Mt. Moses. Var. KLAMATHENSE Jepson, Man. 472 (1925). *Grossularia klamathensis* Cov. N. Am. Fl. 22:225 (1908), type loc. Keno, Klamath Co., Ore., *Applegate* 2008.

14. **R. leptanthum** Gray var. **lasianthum** Jepson. ALPINE GOOSEBERRY. Freely, intricately and rigidly branched, forming low round bushes 1 to 3 feet high; bark white, shreddy; stems with 1 to 3 slender spines at the nodes, rarely with prickles; leaves minutely puberulent or nearly glabrous, 4 to 6 lines wide, roundish, deeply cleft, the petioles pubescent; racemes 1 or 2 (rarely 3 or 4) -flowered; calyx yellow, its tube cylindrical, 3 to 4 lines long (2 to 3 times as long as broad), hairy-pubescent, often annular-dilated above the ovary; petals white, equaling the stamens; ovary glabrous; berry glabrous, smooth, crimson, 3 lines in diameter.

High mountains, 7000 to 10,000 feet: Sierra Nevada. June-Aug.

Locs.—Castle Peak, Nevada Co., *Keller* 7088; Keith Dome, Glen Alpine, Eldorado Co., *Pendleton & Reed* 1057; Lake Merced, Merced River, *Jepson* 3199; Farewell Gap, *Jepson* 996.

Refs.—RIBES LEPTANTHUM Gray, Mem. Am. Acad. ser. 2, 4:53 (1849), Rio del Norte near Santa Fe, *Fendler* 254. Var. LASIANTHUM Jepson, Man. 472 (1925). *R. lasianthum* Greene, Pitt. 3:22 (1896), type loc. Castle Peak, *Greene. Grossularia lasiantha* Cov. & Britt., N. Am. Fl. 22:219 (1908).

15. **R. quercetorum** Greene. ROCK GOOSEBERRY. Rounded shrub 2 to 5 feet high, very densely involved on account of the horizontally spreading or recurving branches; stems not at all or only sparingly bristly; spines mostly solitary; leaf-blades deeply cleft and incised-toothed, finely puberulent, rarely subglabrous, usually minutely glandular, 4 to 6 (or 9) lines broad; flowers 3 to 4 lines long; calyx-lobes little longer than the petals; calyx yellow, puberulent, its tube nearly as broad as long in early anthesis; petals yellow, narrowly oblong-spatulate, a little longer than the stamens; style glabrous, undivided or nearly so; ovary and berry glabrous and smooth; berry 2½ to 3 lines in diameter.

Foothills, on open oak-covered or rocky slopes, 800 to 3000 feet: Sierra Nevada from Tuolumne Co. to Kern Co.; South Coast Ranges from Alameda Co. to San Luis Obispo Co.; Tehachapi Mts.; in or near the San Jacinto Range and southward. Lower California, Arizona. Feb.-Mar.

Habit note.—In the Mt. Hamilton Range the quite erect stems are frequently many from the base, their branches recurving or drooping, so that the outline of the bush is, in a way, vase-shape but exaggerated in breadth.

Locs.—Sierra Nevada foothills: near Mountain Pass, Tuolumne Co., *A. L. Grant* 624; White Rock and Mormon Bar, Mariposa Co., *Congdon;* Middle Tule River, *Purpus* 5073. South Coast Ranges: Arroyo Mocho, Mt. Hamilton Range, *Jepson* 10,672; Priest Valley, San Carlos Range, *Jepson* 2669; Paso Robles, *Barber;* near Mustang Peak, se. Monterey Co., *Jepson* 16,169; Palo Prieto Cañon, San Luis Obispo Co., *Jepson.* Tehachapi Mts.: Girard sta., Kern Co., *Heller* 7708; Keene, Kern Co., *K. Brandegee.* S. Cal.: San Bernardino, *Parish* 3630; Box Springs Mt., Riverside, *F. M. Reed* 2245; Warner Ranch, San Diego Co., *T. Brandegee;* Grapevine Spr., w. Colorado Desert, *T. Brandegee.*

Refs.—RIBES QUERCETORUM Greene, Bull. Cal. Acad. 1:83 (1885), type loc. Paso Robles, *Greene;* Jepson, Man. 472 (1925). *R. leptanthum* var. *quercetorum* Jancz. Mém. Soc. Genève 35:380 (1907). *R. congdonii* Hel. Muhl. 1:101 (1904). *R. velutinum* var. *congdonii* Jancz. l.c. 381 (1907).

16. **R. velutinum** Greene. PLATEAU GOOSEBERRY. Similar to R. leptanthum var. lasianthum; leaves minutely and often densely pubescent; calyx yellow, its tube very short (1 line long), as broad as or broader than long in the fresh flower; ovary lightly or densely hairy; berry hairy, 2 to 3 lines in diameter.

Mountain slopes, mostly of the interior plateau, 3000 to 8200 feet: Trinity and Siskiyou Cos. to Modoc Co., thence south on the east side of the Sierra Nevada to Inyo Co. May-June.

Field note.—Near South Fork Peak, Lassen Co., this species is associated with Juniperus occidentalis Hook., Cercocarpus ledifolius Nutt. and Amelanchier alnifolia Nutt. On a given shrub some branches are spiny, some spineless, or again some very spiny shrubs are found side by side with spineless ones.

Locs.—Pin Creek, Salmon Mts.; Klamath River, Siskiyou Co., *Butler* 1374; Edgewood, Siskiyou Co., *J. W. Kisling;* Egg Lake, Modoc Co., *M. S. Baker;* Forestdale, Modoc Co., *Nutting;* Alturas, *Goldsmith;* South Fork Peak, Lassen Co., *Jepson* 7820; Eagle Lake, Lassen Co., *J. Grinnell;* Silver Cañon, White Mts., *Heller* 8264; Mt. Whitney, *Jepson* 1096; Nelson Range, Inyo Co.; Argus Peak, Inyo Co., *Purpus* 5373; Telescope Peak, Panamint Range, *Jepson* 7027.

Var. **glanduliferum** Jepson. Shrub, densely and intricately branched, exceedingly spiny, 3 to 5 feet high, mostly broader; berry a little greenish-translucent, densely (sometimes sparsely) covered with long gland-tipped hairs and also more or less finely pubescent.—Interior plateau at stations just north, east and south of the crests of the mountains surrounding the Great Valley of California or on their easterly summits, thence south to the San Gabriel Mts., 2000 to 9400 feet: Yreka, *Butler* 267, 1308; Silver Cañon, White Mts., *Jepson* 7232; Sawmill Peak, near Mt. Pinos, *Hall* 6574; Mt. San Antonio, *Peirson* 70.

Refs.—RIBES VELUTINUM Greene, Bull. Cal. Acad. 1:83 (1885), "northern California and regions adjacent"; Jepson, Man. 472 (1925). *R. leptanthum* var. *brachyanthum* Gray, Bot. Cal. 1:205 (1876), type loc. foothills near Carson City, Nev., *Anderson, Watson. R. brachyanthum* Card, Bush Fruits 460 (1898). *Grossularia velutina* Cov. & Britt. N. Am. Fl. 22:220 (1908). Var. GLANDULIFERUM Jepson, Man. 472 (1925). *R. glanduliferum* Hel. Muhl. 2:56 (1905), type loc. Yreka, *Heller* 8005. *R. stanfordii* Elmer, Bot. Gaz. 41:315 (1906), type loc. Griffin, Mt. Pinos, *Elmer* 3958.

17. **R. amarum** McCl. BITTER GOOSEBERRY. Bush, 2 to 3 feet high; stems not prickly; flowers 6 to 8 lines long; calyx funnelform, puberulent and somewhat stipitate-glandular, its tube twice as long as broad, its lobes broad, red-purple; petals nearly as long as the filaments; ovary very densely covered with very short gland-tipped bristles, also often puberulent; berry 5 to 6 lines in diameter, densely covered with short stout spines; skin of berry tough, nauseous; spines more or less glandular, ¼ to 1½ lines long.

Mountain slopes, 1000 to 4000 feet: coastal Southern California; north in the Sierra Nevada to Mariposa Co. Mar.-Apr. Allied to R. menziesii var. faustum Jepson.

Locs.—Palomar, *Jepson* 1493; Cañon Diablo, San Bernardino Mts., *Parish* 5545; Waterman Cañon, San Bernardino Mts., *Parish;* San Antonio Cañon, Claremont, *Baker* 4064; Mt. Wilson, *Peirson* 316; Santa Barbara, *Jepson* 9118; Lookout Pt., Mineral King road, *Jepson* 1030; Fortman Mt., Mariposa Co., *Congdon.*

Refs.—RIBES AMARUM McCl. Erythea 2:79 (1894), type loc. cañons of the San Gabriel Mts., *McClatchie;* Jepson, Man. 473 (1925). *R. mariposanum* Congdon, Erythea 7:183 (1900), type loc. coniferous belt, Mariposa Co., *Congdon. R. menziesii* var. *amarum* Jancz. Mém. Soc. Genève 35:363 (1907). *Grossularia amara* Cov. & Britt. N. Am. Fl. 22:216 (1908).

18. **R. roezlii** Regel. SIERRA GOOSEBERRY. Stout shrub 1½ to 3 or 5 feet high and half again or twice as broad, with many long diffusely spreading branches; nodes with 1 to 3 spines; prickles none; leaves pubescent, sometimes nearly glabrous, 3 to 5-cleft into toothed lobes, 6 to 11 lines wide (sometimes 2 inches); pedicels 1 (or 2) -flowered, the bracts often straw-color, usually in pairs near apex of peduncle; flowers 6 to 10 lines long; calyx dull red, puberulent, often densely whitish-pubescent, its tube 1½ to 2 times as long as broad, as long or nearly as long as the lobes; petals white, involute, over half as long as the stamens; ovary densely white-hairy or at least pubescent, the long spines intermixed with some

short gland-tipped ones; berry yellowish, pinkish or purplish, or becoming deep red-brown when ripe, large, (6 or) 8 to 10 lines in diameter, beset with long stout more or less pubescent or short-pilose spines.

Mountain slopes and cañon valleys, 2000 to 7000 feet: Sierra Nevada (the most common gooseberry at middle altitudes), south to coastal Southern California, north to Modoc Co.; inner North Coast Ranges from Humboldt Co. to Lake Co. May-July.

Field note.—The many long branches are usually heavily weighted with fruit in season. It is perhaps our most fertile native gooseberry, flowers being produced all along the main stems quite to the ground.

Locs.—Sierra Nevada: Eagle Lake, *Jones;* Hot Spring Valley, Lassen Peak, *Jepson* 4084, 12,296; Mineral, Tehama Co., *J. Grinnell;* Rough & Ready, Nevada Co., *Jepson* 13,518; Rebel Ridge, Camptonville district, *L. S. Smith* 1761; Bear Valley, Nevada Co., *Jepson* 13,516; Truckee, *Sonne* 425, 1569; Lily Lake, Glen Alpine, *Pendleton & Reed* 1218; Kyburz, South Fork American River, *Ramaley* 11,267; Antelope, Amador Co., *Hansen* 1679; Calaveras Big Trees, *A. L. Grant;* Columbia, *A. L. Grant* 618; Hetch-Hetchy, *Jepson* 3454, 3472; Chowchilla School, 10 mi. e. of Mariposa, *Jepson* 12,812; Crane Flat, Yosemite, *Jepson* 10,434; Bass Lake, Madera Co., *Jepson* 12,861; Bubbs Creek, *Jepson* 792; Millwood, *Jepson* 2783, 2788; Happy Camp Mdw., North Fork Tule River, *Jepson* 4701; South Fork Middle Tule River, *Jepson* 4880. Tehachapi Mts.: Girard sta., *Heller* 7707; Ft. Tejon, *Parish* 1930. S. Cal.: Griffin, Mt. Pinos, n. Ventura Co., *Elmer* 3811; Acton, Los Angeles Co., *Elmer* 3604; Mt. San Antonio, *Peirson* 70; Mill Creek Cañon, San Bernardino Mts., *Jepson* 5578, 5586; Mt. San Jacinto, *Hall* 2762; Palomar, *Parish* 4404, *Jepson* 1497; Volcan and Cuyamaca mountains, *T. Brandegee;* Grapevine Cañon, w. side of Colorado Desert, *T. Brandegee.* North Coast Ranges: Mail Ridge, Humboldt Co., *Jepson* 16,389; Castle Peak, ne. Mendocino Co., *Jepson* 13,519 (intergrading to var. cruentum); Mt. Sanhedrin, *Purpus* 1118.

Var. **amictum** Jepson comb. n. Leaves whitened beneath with a fine pubescence; bracts hoary, usually concealing the ovary; calyx hoary, especially when young; berry spines subglabrous.—Upper basin of the South Fork Eel River and the neighboring mountains, 400 to 2000 feet: Mail Ridge, *Jepson* 1889; Garberville, *Tracy* 6159; Little Red Mountain Creek, *Jepson* 9471; Leggett Valley, *Tracy* 6625; Sherwood forest, *Jepson* 13,515.

Var. **cruentum** Rehd. Bleeding Flower. Habit, foliage and flowers similar to R. roezlii; leaves commonly glabrous; calyx dark purple, glabrous; ovary strictly glabrous, that is, not hairy or pubescent, but densely covered with long bristle-like spines which are set about at base with a rather dense layer of stiped glands; spines of the berry numerous, non-glandular and non-pilose.—Openly wooded mountain slopes, 600 to 3000 (or 5000) feet: North Coast Ranges, in the middle and inner ranges, from Napa Co. to Siskiyou Co. North to Josephine Co., Oregon. Feb.-Apr.

Geog. note.—In the main the var. cruentum occupies an area distinct from that of R. roezlii. Nevertheless, where the ranges of these two forms meet, plants occur which can only be placed in the category of intergrades. The detailed features of pubescence become variable or disappear in part while the number and length of the short-stiped ovary glands is inconstant. The fruit of var. cruentum with its densely-set stramineous spines is somewhat suggestive of a tiny chinquapin bur, a feature which in connection with its flowers indicates relationship to R. menziesii var. hesperium Jepson. It has some claims to specific rank.

Locs.—Oro Fino, *Butler* 1535; Humbug, Siskiyou Co., Butler 645; Shackelford Cañon, Marble Mt., *Jepson* 2812; Salmon Mts.; Shasta Retreat, *Butler* 655; Devil's Backbone, Trinity Summit, *Jepson* 2059; Three Creeks, Humboldt Co., *Tracy* 6041; Willow Creek, Trinity River, *Tracy* 3309; Trinity River near the South Fork, *Graham;* Mt. St. Helena, *Jepson* 13,522, 13,523; Napa Range, e. of Calistoga, *K. Brandegee;* Little Sulphur Creek, Sonoma Co., *M. S. Baker;* Caux Cabin, w. of St. Helena, *Jepson* 13,524, 13,525; Hood's Peak, *M. S. Baker;* Cazadero, *Heller* 6615.

Refs.—Ribes roezlii Regel, Gartenfl. 28:226, t. 982, figs. 1–3 (1879), cult. from seed collected in western North America by Benito Roezl, probably in the Sierra Nevada (cf. Gartenfl. 19:296); Jepson, Man. 472, fig. 468 (1925). *R. wilsonianum* Greene, Erythea 3:70 (1895), type loc. "mts. of Kern Co." (undoubtedly collected in the Tehachapi Range), *N. C. Wilson. R. aridum* Greene, Pitt. 4:35 (1899), type loc. Caliente, Kern Co., *N. C. Wilson. Grossularia roezlii* Cov. & Britt. N. Am. Fl. 22:215 (1908). Var. amictum Jepson. *R. amictum* Greene, Pitt. 1:69 (1887), type loc. Garberville, Humboldt Co., *Bush.* Var. cruentum Rehd.; Bailey, Stand. Cyclop. Hort. 5:2962 (1916); Jepson, Man. 472 (1925). *R. cruentum* Greene, Pitt. 4:35 (1899), type loc. Sonoma Co. (most probably Hoods Peak Range); Skan, Bot. Mag. pl. 8105 (unquestionably this species as shown by the specimen preserved in the Kew Herbarium). *R. amictum* var. *cruentum* Jancz. Mém. Soc. Genève 35:366 (1907). *Grossularia cruenta* Cov. & Britt. N. Am. Fl. 22:215 (1908).

19. **R. menziesii** Pursh. Cañon Gooseberry. Openly branched bush 3 to 8 feet high; stems more or less densely prickly, with mostly 3 spines at the nodes; bark brownish; leaf-blades 3 to 5-cleft, toothed, truncatish at base, glabrous or nearly so above, finely pubescent beneath and also with scattered gland-tipped bristles, ¾ to 1 (or 1½) inch wide, the petioles about 3 to 6 lines long; peduncles 1 or 2-flowered, 10 to 12 lines long, the 2 bracts discrete, borne above the middle; flowers 6 to 8 lines long; calyx red-purple, a little puberulent and with a few minute scattered gland-tipped bristles; calyx-tube 1 to 1¼ lines long; filaments equaling to 1¾ times as long as the white petals; anthers shortly but distinctly apiculate; style exceeding the stamens; ovary globose, rather thickly covered with gland-tipped spines of unequal length and exhibiting a little whitish puberulence; berry spiny, 5 to 6 lines in diameter, the spines 1½ to 2 lines long.

Cañons and flats along the coast, 50 to 700 feet: Humboldt Co. to Del Norte Co. North to southern Oregon. Feb.-Apr.

Locs.—Van Duzen gravel bar near Carlotta, *Tracy* 5985; Eureka, *Tracy* 2941, 2130; Blue Lake, Humboldt Co., *Tracy* 3568; Drakes Hill near Alton, *Tracy* 5421; Luffenholtz Creek, Trinidad, *Tracy* 4866; Crescent City, *Howell* 1432.

Endemic variants.—Ribes menziesii, in a broad sense, is a variable species of the Redwood belt, and thence to Los Angeles Co., but always in the immediate vicinity of the coast, save for the var. hystriculum of Mt. Diablo, the var. leptosmum, which recurs at Mt. Diablo, and for the var. hesperium, the most pronounced southern variation, which extends somewhat inland. The original specimens of the species were collected at Trinidad on the Humboldt coast in 1791 by Archibald Menzies of the Vancouver Expedition and are well matched by modern specimens collected at Eureka (*Tracy* 2941). In an extremely narrow and restricted sense this original botanical type occurs only on the Humboldt coast, but is everywhere subject to slight modifications as it ranges southward. These modifications are, with a few exceptions, too trivial to merit even varietal recognition, although some of them are by us thus ranked because of a certain circumstance in relation to localized differentiation. Each marked or definite minor topographic and climatic area along the coast is characterized by a Ribes menziesii form bearing a certain combination of structural features, and this plant form occurs only in its own particular area, representing in each case extremely refined differences in pubescence or distribution of pubescence or absence of such; in degree or character or distribution of glandulosity or absence of such; and in size, length or number of the berry spines. While these features are so slight as to defy in all probability satisfactory written diagnosis, yet, after familiarity born of years of study in the field, garden and herbarium, we are able by aid merely of a lens to identify each particular geographic form. For example, the California specimens of David Douglas (collected in 1831) never carried a special locality, but one may now say of his specimens that Ribes menziesii var. hystrix Jepson was collected by him with scarcely any doubt at Point Lobos near Carmel, and not further southward on the Monterey coast (where the var. hystrix also occurs), and, similarly, that his specimens of the var. hesperium Jepson were collected at Santa Barbara, and not easterly in the San Gabriel Mountains. These minute differences thus come to have a special significance, because it would appear that they are inherited in each district over long periods without appreciable variation. This species is, therefore, interesting for its minute geographic variants in association with minor climatic districts along the Californian coast. All these geographic phases of the species would be explained by some botanists as hybrid segregations but we prefer to think that they are climatic and topographic variants, since each is so closely associated with the climatic elements of rainfall, temperature, humidity and insolation, and the edaphic factors.

Tax. note.—We find that relative length of petals and stamen-filaments is unimportant as a distinguishing mark in the Ribes menziesii group, but significance may be attached to the character of the fruit and, within certain limits, to pubescence and glandulosity. The type of Ribes leptosmum Cov. has been compared by us with the type of Ribes subvestitum H. & A. at the Royal Botanic Gardens, Kew, and found to be identical. The type of R. subvestitum H. & A. is, in turn, essentially identical with the type of R. menziesii Pursh, preserved at the Natural History (British) Museum, differing only slightly in one particular, that is in a minute degree of glandulosity of the lower side of the leaf. This extremely slight difference, however, represents a link in the chain of variants southward along the coast and we, therefore, on this account, retain the name var. leptosmum, thus completing a geographic series, which is to be described as follows:

Var. **leptosmum** Jepson. Similar to the species, the leaves glandular-dotted (or with sessile glands) beneath as well as with stalked glands, but somewhat less puberulent.—Low hills and cañons, 10 to 900 feet: flats or hillslopes, Mendocino Co. to Santa Clara Co.: Ft. Bragg, *W. C. Mathews* 99; Inverness, Marin Co., *Jepson* 503; Olema, Marin Co. *Jepson* 13,512; Mt. Tamalpais, *Jepson* 13,513; upper Marsh Creek, Mt. Diablo, *Jepson* 9996; near Stanford, *C. F. Baker* 279; Mt. Hamilton, *Pendleton* 872.

Var. **hystriculum** Jepson var. n. Stems prickly as in the species; leaves glandular beneath as in the variety leptosmum, or the sessile glands obscure; ovary quite concealed by the dense covering of spines, the spines gland-tipped.—(Caules aculeosi; folia subtus glandula, vel glandulis sessilibus obscuris; ovarium spinis glanduloso-mucronatis dense tectum.)—Mt. Diablo, at summit, amongst Quercus chrysolepis (*Mary Bowerman* 314, type).

Var. **senile** Jepson. Stems prickly; nodal spines on the season's growth often yellow; leaves a little glandular; ovary densely white-hairy, the spines red, relatively few; berry a little villous, armed with much-scattered very slender gland-tipped spines 1½ to 1¾ lines long.—East slope of the Santa Cruz Mts. in Santa Clara Co.: Lake Ranch road, *Pendleton* 1328; Los Gatos Cañon, *A. H. Wolley-Dod* 216, 435.

Var. **retineatum** Jepson var. n. Stems prickly; nodal spines yellow; leaves pilose-puberulent and with a few stalked glands, especially beneath, tending to persist over the winter; peduncles 1¼ to 2 inches long; calyx-tube 2½ lines long; berry black.—(Spinae nodorum flavae; folia piloso-puberulentia, glandulis paucis, hiemem persistere inclinata; pedunculi unc. 1¼–2 longi; calycis tubus lin. 2½ longus; bacca nigra.)—Santa Cruz Mts. on Gilroy grade to Watsonville (*Jepson* 13,510, type).

Var. **hystrix** Jepson. Stems prickly; leaves thickish, thinly or weakly puberulent, sprinkled beneath with sessile glands; peduncles 1 to 1¼ inches long; berry large, purple, 6 to 7 lines in diameter, spiny.—Monterey County coast from Pt. Lobos to Point Gorda: Pt. Lobos, *Pendleton* 518; Limekiln Creek, *Jepson* 1681. First collected by Douglas, doubtless at Pt. Lobos near Carmel Mission.

Var. **hesperium** Jepson comb. n. Stems not prickly; leaves minutely puberulent, not glandular; calyx reddish-purple; ovary and berry glabrous or sometimes puberulent, densely covered with slender spines, all the spines non-glandular, or a few shorter ones gland-tipped.—Cañons, 800 to 3500 feet: Santa Inez Mts.; Santa Monica Mts.; San Gabriel Mts.

Tax. note.—No other species of our Ribes have a berry so densely spiny as the var. hesperium of R. menziesii. This particular character, as well as its flower and glabrous ovary and berry, seems to indicate points of relationship with R. roezlii var. cruentum Rehd.

Locs.—Santa Barbara; Santa Monica Cañon, *Barber* 6; Sepulveda Cañon, Santa Monica Mts., *Abrams* 3119; San Antonio Cañon, Claremont, *C. F. Baker* 4063; Palmer Cañon, Claremont, *Chandler*.

Var. **thacherianum** Jepson var. n. Stems not prickly; nodal spines few or none; leaf-blades markedly puberulent beneath; petioles pilose; flowers 6 lines long; petals 3/5 as long as sepals.—(Caules non aculeati; spinae nodorum paucae vel absentes; folia subiter manifeste puberulenta; petioli pilosi; flores lin. 6 longi.)—Santa Cruz Isl., *Olive Thacher*.

Var. **faustum** Jepson var. n. Stems not prickly; leaves subglabrous, thickly sprinkled beneath with stalked and especially sessile glands; anthers white or sometimes lavender; berry rather thickly covered with equal short gland-tipped spines ½ line long.—(Caules non aculeati; folia subglabra, subiter glandulis stipitatis vel praecipue sessilibus sparsa; antherae aliquando pallido-purpureae, bacca spinulis brevibus crebrae.)—Cañons, Berkeley and Oakland hills: Strawberry Cañon, *Jepson* 6229d, 9788 (type), 9802; Oakland Hills, *Jepson* 6820, *Bolander*, *Jones*. It is allied to Ribes amarum McCl.

Refs.—RIBES MENZIESII Pursh, Fl. 732 (1814), type loc. Fort Trinidad, Humboldt Co., *Menzies*; Lindl. Bot. Reg. 33, t. 56 (1847); Jepson, Fl. W. Mid. Cal. 274 (1901), ed. 2, 203 (1911), Man. 473 (1925). *Grossularia menziesii* Cov. & Britt. N. Am. Fl. 22:213 (1908). Var. LEPTOSMUM Jepson, Man. 474, fig. 470d (1925), excluding the shrubs of Contra Costa and Alameda Cos. *R. subvestitum* H. & A. Bot. Beech. 346 (1840), type from Cal., *Douglas*. *Grossularia leptosma* Cov. & Britt. N. Am. Fl. 22:214 (1908), type loc. Bear Valley, Marin Co., *Davy* 696. Var. HYSTRICULUM Jepson. Var. SENILE Jepson. *Grossularia senilis* Cov. N. Am. Fl. 22:214 (1908), type loc. Saratoga, Santa Clara Co., *Heller*. Var. RETINEATUM Jepson. Var. HYSTRIX Jepson. *R. hystrix* Eastw. Proc. Cal. Acad. ser. 3, Bot. 2:248, pl. 24, figs. 10a, 10d (1902), type loc. Gorda, Santa Lucia Mts., *R. A. Plaskett*. *Grossularia hystrix* Cov. & Britt. N. Am. Fl. 22:213 (1908). Var. HESPERIUM Jepson. *R. californicum* var. *hesperium* Jepson, Man. 473 (1925). *Ribes occidentale* var. *hesperium* Jancz. Mém. Soc. Genève 35:368 (1907). *R. hesperium* McCl. Erythea 2:79 (1894), type loc. cañons, San Gabriel Mts., *McClatchie*. Var. THACHERIANUM Jepson. Var. FAUSTUM Jepson. *R. menziesii* var. *leptosmum* Jepson, Man. 474, fig. 470a-c, excluding the Marin Co. shrubs.

20. **R. californicum** H. & A. HILL GOOSEBERRY. Compact shrub with more or less zig-zag or flexuous branches, 2½ to 5 feet high; nodal spines 3 (or 1); prickles none; leaf-blades roundish, 3 to 5-cleft, crenate, glabrous or nearly so, and non-glandular, 1 to 1½ inches wide; flowers solitary (sometimes 2), 4 to 5 lines long;

calyx greenish, dull white, or sometimes purplish-tinged, glabrous, sometimes minutely puberulent, sometimes the lobes tipped with a few pilose hairs; petals white, ¼ to ½ as long as the stamens; ovary glabrous, or sometimes puberulent, but covered with rather long spines, these rarely interspersed with shorter gland-tipped ones; berry usually small, 3 to 4 or 5 lines in diameter, the spines slender.

Hills or narrow cañon flats, most characteristic of dry exposed or rocky slopes, 100 to 2500 feet: central Coast Ranges from Monterey Co. to Mendocino Co. Jan.-Apr.

Variability.—Of all our Californian species of gooseberries, none perhaps is more variable than R. californicum H. & A. except R. menziesii Pursh. In its region every cañon, every flat, every hillslope with a definite topographic character has its own type of shrub. The plants differ in spininess, in the extent to which their branchlets are zig-zag, in degree of pubescence of leaves, of peduncles, of calyces, of ovaries, and in number of spines on the fruit. The flowers are seldom absolutely glabrous, frequently almost so, though always inconstant in a minute manner; while thus markedly varying in degree, the pubescence is usually extremely scanty, though exceptionally one finds rather pubescent flowers. The fruits show the greatest range in the matter of presence of spines. Shrubs at Lake San Andreas (*Jepson* 9540) show quite unarmed berries as do shrubs at Long Ridge road near Wrights, Santa Cruz Mts. (*Wolley-Dod* 402). From this quite naked condition we have shrubs exhibiting just a few scattered spines on the berry (R. oligacanthum Eastw.) continuously to those which develop rather densely spiny fruits.

The original specimens of R. californicum H. & A. (California, 1831) were gathered by David Douglas *in early flower* with few leaves as yet developed, and represent the thorny rigid-stemmed quite glabrous form of rocky hills having glabrous non-glandular foliage and flowers and moderately armed ovaries with short spines. The original Douglas specimens of R. occidentale H. & A., collected in California in 1831, are in a more advanced stage; they are like the R. californicum specimens in every technical particular, differing only in aspect, the branches being leafier and more pliable. Our examination of the types of these forms was made at the Royal Botanic Gardens in Kew, England, in 1930, some forty modern specimens from west central California being critically compared with them. As to flower pubescence, our series of specimens show every transition from branchlets bearing glabrous flowers and flowers with a few hairs to specimens in which the flowers are obviously a little pubescent.

Locs.—Priest Valley, San Carlos Range, *Jepson* 2670; Guadalupe Mine, Santa Cruz Mts., *Jepson* 9088; Los Gatos, *Heller* 7249; Saratoga, *Pendleton* 287, 519, 524, 527; Stanford, *C. F. Baker* 316; Lake San Andreas, San Mateo Co., *Jepson* 9540, 9543; Pilarcitos Creek, San Mateo Co., *Davy* 1058; Los Buellis Hills, Santa Clara Co., *R. J. Smith;* Arroyo Mocho, Mt. Hamilton Range, *Jepson* 10,682; Berkeley Hills, *Jepson* 6229b; Mt. Diablo; Seaview, Sonoma Co., *M. S. Baker;* Watson Cañon, Sonoma Co., *Bioletti;* Calistoga (mts. e.), *Jepson* 13,511; Kelseyville, *Irwin;* Potter Valley, *Purpus* 910, 1007.

Refs.—RIBES CALIFORNICUM H. & A. Bot. Beech. 346 (1840), type from Cal., *Douglas* (typ. vidi); Jepson, Fl. W. Mid. Cal. 274 (1901), ed. 2, 202 (1911), Man. 473, fig. 469 (1925). *Grossularia californica* Cov. & Britt. N. Am. Fl. 22:214 (1908). *R. occidentale* H. & A. l.c., type from Cal., *Douglas* (typ. vidi). *R. oligacanthum* Eastw. Proc. Cal. Acad. ser. 3, Bot. 2:246, pl. 24, figs. 8a, 8b (1902), type loc. near Mansfield Ranch, King City, *Eastwood* (typ. vidi).

21. **R. victoris** Greene. VICTOR'S GOOSEBERRY. Bush 2 to 5 feet high; nodal spines 1 to 3, the newer branches prickly; leaf-blades incisely 5-lobed, cordate at base, crenate, the lower pair of lobes much smaller, sparsely puberulent, and with gland-tipped hairs and sessile glands or dots, especially below; peduncles 5 to 6 lines long, 1 or 2-flowered; flowers 5 to 7 lines long; sepals greenish-white; ovary thickly covered with short gland-tipped processes and a few longer non-glandular spines.

Cañons, 500 feet: near Lake Lagunitas, north side of Mt. Tamalpais, Marin Co., only one or two shrubs known. Mar.

Var. **greeneianum** Jepson. Leaf-blades truncatish at base to cordate, not at all or scarcely glandular, ½ to 1¾ inches wide, peduncles ½ to 1¼ inches long; flowers 6 to 8½ lines long; ovary densely covered with short-stiped glands (appearing sometimes as if tessellated), non-glandular spines none; berry oval, yellow or red-brown, thickly covered with short gland-tipped spines, 6 to 8 lines in diameter.—Cañons or flats, 400 to 1500 feet: Hoods Peak Range (Sonoma Creek, *Heller* 5773, Adobe Cañon, *Michener & Bioletti;* Niebaum's Dam, near St. Helena, *Jepson* 13,499); Napa Range (Mt. St. Helena, *Alice King,* Middleton grade, *Jepson* 13,507); Vaca Mts. (Gates Cañon, *Jepson* 13,506, 13,508, 13,528).

Refs.—Ribes victoris Greene, Pitt. 1:224 (1888), type loc. Lake Lagunitas, Mt. Tamalpais, *Victor K. Chesnut* (typ. vidi); Jepson, Fl. W. Mid. Cal. 273 (1901), ed. 2, 202 (1911), Man. 474 (1925), in small part. Var. greeneianum Jepson, Man. 474 (1925). *R. greeneianum* Hel. Muhl. 1:111 (1905), type loc. Vaca Mts., *C. F. Baker* 2915. *Grossularia greeneiana* Cov. & Britt. N. Am. Fl. 22:212 (1908). *R. victoris* Jepson, Fl. W. Mid. Cal. 273 (1901), ed. 2, 202 (1911), mainly. *R. menziesii* var. *minus* Jancz. Mém. Soc. Genève 35:363 (1907), type loc. Middleton grade, Mt. St. Helena, *Jepson* 13,507 (a form of the dry hills), (typ. vidi). *R. victoris* var. *minus* Jepson, Man. 474 (1925).

22. **R. sericeum** Eastw. Lucia Gooseberry. Erect branching shrub "several feet high", the stems very prickly, the prickles bristle-like; herbage with a short-pilose whitish pubescence; leaf-blades thinnish, deeply 3 (or 5) -cleft; raceme (1 or) 2-flowered, on peduncles ¾ to 1¼ inches long; peduncles slender, white-pilose and bristly with gland-tipped bristles; flowers 9 to 11 lines long; sepals red, sparingly villous; petals rather less than half as long as the stamens; anthers drab or tan-color, not apiculate; ovary densely covered with gland-tipped spines and intervening white hairs; berries often large (8 to 11 lines in diameter), spiny.

Cañons, 5 to 1000 feet: Santa Lucia Mts., mostly along the coast. Feb.-Mar.

Geog. note.—It seems likely that wherever Ribes sericeum occurs, it replaces R. menziesii. Our former student, Stephen N. Wyckoff, says that Ribes menziesii var. hystrix stops a few miles south of Monterey on the Santa Lucia coast, and that Ribes sericeum begins with equal abruptness and continues southward some distance.

Locs.—Bixby Creek, *Wyckoff* 99; Little Sur, *Davy* 7378; Big Creek, *K. Brandegee;* Gorda, *Plaskett;* Santa Margarita, *Berg.*

Refs.—Ribes sericeum Eastw. Proc. Cal. Acad. ser. 3, Bot. 2:246, pl. 24, figs. 9a–9f (1902), type loc. Gorda, Santa Lucia Mts., *Plaskett* (typ. vidi); Jepson, Man. 475 (1925).

23. **R. marshallii** Greene. Hupa Gooseberry. Low, spreading, sometimes forming almost mat-like colonies 3 to 7 feet across; flowers similar to those of R. lobbii; calyx-tube bowl-shaped, as broad or broader than high; calyx-lobes crimson, 2 lines broad, 6 to 7 lines long; petals yellow; anthers glandless; ovary white-woolly, with non-glandular spines imbedded in the tomentum; berry subglobose, 6 to 7 lines in diameter, covered with long (2 to 3 lines) glandless spines.

High montane, 6000 to 7000 feet: Humboldt and Siskiyou Cos. July.

Locs.—Buck Mt., Humboldt Co., *Tracy* 4189; Trinity Summit, *Manning;* Shackelford Cañon, w. Siskiyou Co., *Jepson* 2819.

Refs.—Ribes marshallii Greene, West Am. Sci. 3:24 (1887), type loc. Trinity Summit, *C. C. Marshall* (typ. vidi), Pitt. 1:31 (1887); Jepson, Man. 475 (1925).

24. **R. lobbii** Gray. Oregon Gooseberry. Bush 2 to 3 feet high; herbage sparingly glandular-pubescent; spines at nodes 3; leaf-blades ¾ to 1¼ inches broad, 3-lobed and serrate, sparsely hispidulose; peduncles 1 to 3-flowered; flowers pendulous, 10 to 11 lines long; calyx crimson or Turkish red, sparingly hairy outside, its tube cylindric, longer than broad; calyx-lobes long-oblong, somewhat spreading or recurved-coiling, longer than the tube; petals involute, white; stamens and style much exserted; anthers with minute wart-like glands on the back; ovary densely covered with stipitate glands as if tessellated, half-sheathed or closely subtended by a truncate bract; berry oval, 6 to 8 lines long, densely covered with short gland-tipped spines.

High montane, 5500 to 6500 feet: northern Lake Co. to Siskiyou Co. North to British Columbia. June.

Locs.—Snow Mt., *T. Brandegee;* Buck Mt., Humboldt Co., *Tracy* 4189; Trinity Summit, *Jepson* 2038, 2044; Salmon Summit, *Jepson* 2093; Cold Spring Camp, Woolly Creek, *Butler* 261; Jackson Lake, Siskiyou Co., *Alexander & Kellogg;* Humbug Creek, Siskiyou Co., *Butler* 265, 1442. Ashland, Ore., *Howell.*

Refs.—Ribes lobbii Gray, Am. Nat. 10:274 (1876), type loc. Vancouver Island, *Wood;* Jepson, Man. 475 (1925). *R. subvestitum* Hook. Bot. Mag. t. 4931 (1856), not H. & A.

25. **R. binominatum** Hel. Ground Gooseberry. Stems trailing, not bristly, 2 to 4 feet long; nodal spines 3, unequal; leaf-blades 3 to 5-cleft, ¾ to 1½ inches

broad, glabrous or weakly pubescent and often glandular above, more or less silky-pubescent beneath; calyx greenish-white, villous, 4 to 4½ lines long, its tube very short (1 to 1½ lines), the lobes 2 to 2½ times as long; stamens little exceeding the petals; berry usually glandular, armed with stout-based yellowish spines of very unequal length, and also provided with many slender short gland-tipped bristles set between.

Higher mountains, 3000 to 6000 feet: southern Sierra Nevada; northern California. Southern Oregon. June.

Locs.—Tulare Co.; Shackleford Creek, w. Siskiyou Co., *Butler* 259. Ashland Butte, Ore., *Howell.*

Refs.—Ribes binominatum Hel. Cat. ed. 2, 5 (1900); Jepson, Man. 474 (1925). *Grossularia binominata* Cov. & Britt. N. Am. Fl. 22: 218 (1908). Both these binominals rest upon *R. ambiguum* Wats. Proc. Am. Acad. 18:193 (1883), type loc. Scott Mts., *Greene;* not R. ambiguum Maxim. (1874). *R. montanum* Howell, Fl. Nw. Am. 210 (1898), type loc. Siskiyou Mts., *Howell,* not R. montanum Phil. (1860). *Grossularia tularensis* Cov. N. Am. Fl. 22: 218 (1908), type loc. Giant Forest, Sequoia Park, *K. Brandegee.*

26. **R. speciosum** Pursh. Garnet Gooseberry. Tall shrub, evergreen or nearly so, 4 to 10 feet high; branches prickly or almost smooth; spines at nodes 3, very stout (5 to 8 lines long); leaf-blades small (6 to 8 lines long, rarely to 1 or 1½ inches long), shining, coriaceous, roundish to obovoid, roundish or cuneate at base, slightly 3-lobed or -toothed at apex, the lobes often few-toothed or crenate; peduncles 1 or 2-flowered; calyx crimson, its lobes erect, 4 to 5 lines long, the tube above the ovary very short (1 line long), forming a swollen ring; petals involute, narrow, truncate, almost as long as the sepals; stamens and style exserted 8 to 11 lines; anthers oval; ovary densely bristly, the bristles with discoid glands at tip; berry dry, very spiny.

Cañons and valley flats, 5 to 1000 feet: near the coast from Santa Clara Co. to Monterey and south to San Diego. Apr.-May.

Locs.—Coyote Creek, *Chandler* 912; Carmel, *Newlon* 131; San Luis Mt., *Summers;* Santa Barbara, *T. Brandegee;* Carpinteria, *Brewer* 251, 263; Santa Monica, *Barber;* Oceanside, *Parish* 4456.

Refs.—Ribes speciosum Pursh, Fl. 731 (1814), type from "northwest coast", *Menzies,* really California (probably Monterey); Lindl. Bot. Reg. t. 1557 (1832); Jepson, Fl. W. Mid. Cal. ed. 2, 203 (1911), Man. 475 (1925). *Grossularia speciosa* Cov. & Britt. N. Am. Fl. 22:212 (1908).

CROSSOSOMATACEAE. Crossosoma Family

Glabrous shrubs with alternate entire leaves. Flowers regular, solitary, terminal, borne on short naked peduncles arising from winter buds. Calyx 5-lobed, persistent. Petals 5, white. Stamens 15 to 50, inserted in 3 or 4 ranks on a thin disk lining the open calyx-tube; filaments somewhat dilated. Stigma capitate. Follicles 2 to 9, contracted at base into a short or obscure stipe. Seeds several, furnished with a fimbriate aril. Endosperm slightly fleshy; embryo curved.

Bibliog.—Engler, A., Crossosomataceae (Engler & Prantl, Nat. Pflzf. nachtr. 1:185–186,—1897). Vaslit, F. H., Crossosoma (Zoe 1:27,—1896).

1. CROSSOSOMA Nutt.

The only genus.—Species 2, southwestern North America. (Greek krossoi, fringe, and soma, body, in reference to the aril.)

Leaves scattered; petals roundish, scarcely clawed........1. *C. californicum.*
Leaves fascicled; petals oval or obovate, distinctly clawed........2. *C. bigelovii.*

1. **C. californicum** Nutt. Shrub 3 to 6 feet high, or somewhat arboreous and up to 15 feet high; leaves scattered, oblong (or sometimes obovate), tapering slightly to the somewhat obtuse mucronate apex, tapering more strongly to the shortly petioled base, 1½ to 3½ inches long; flowers numerous, 10 to 14 lines broad;

sepals round-ovate, obtuse, scarious-margined; petals obliquely roundish, crinkled; stamens about 40 to 50; follicles 3 to 7 (or 9), oblong-cylindric, 6 to 10 lines long, 20 to 25-seeded.

Islands off the California and Lower California coast: Santa Catalina Island; San Clemente Island; Guadalupe Island. May.

Refs.—CROSSOSOMA CALIFORNICUM Nutt. Jour. Acad. Phil. ser. 2, 1: 150, t. 22 (1847), type loc. Catalina Isl., *Gambel;* Masters, Gard. Chron. ser. 3, 34: 130 (1903); Trask, Erythea 7: 139 (1899); Jepson, Man. 475 (1925).

2. **C. bigelovii** Wats. Erect bush 3 to 4 feet high, with slender branches and short rigid branchlets; leaves mostly fascicled, glaucous, the blades ovate-oblong, sometimes obovate, obtusish and apiculate, 4 to 9 lines long, subsessile; peduncles 3 lines long; corolla white, aging pink or rose, 3½ to 5 or 8 lines wide; petals oval or obovate, with cuneate claw; stamens 15 to 21 "or 30"; follicles 2, rarely 3 or 1, 2 to 5-seeded, 3 to 4 lines long.

Rocky cañons in the desert, 100 to 3000 feet: Colorado Desert. East to Arizona, south to Lower California. Apr.

Locs.—Indian Cañon, Collins Valley, *Jepson & Dutton* 8855; Santa Rosa Mts. (cañons w. of Coachella), *Clary* 657; Palm Sprs., *Parish* 4105; Warrens Well, *T. Brandegee.*

Refs.—CROSSOSOMA BIGELOVII Wats. Proc. Am. Acad. 11: 122 (1876), type loc. near mouth of Bill Williams River, Ariz., *Bigelow;* Jepson, Man. 476 (1925). *C. californicum* Torr. Pac. R. Rep. 4: 63, pl. 1 (1857), excluding plant of Nuttall.

ROSACEAE. Rose Family

Herbs, shrubs or trees. Leaves alternate, commonly with stipules. Flowers regular, commonly perfect, solitary or in clusters. Calyx 5 (or 4)-lobed. Petals 5, rarely none. Stamens 10 to numerous, rarely fewer, usually indefinite in number, inserted with the petals on the calyx-tube (or hypanthium-tube) or on the edge of a disk that lines the calyx-tube. Pistils 1 to many, simple, distinct and free from the calyx, or united into a 2 to 5-celled ovary which is nearly or completely inferior. Fruit a pod (follicle), an achene, a drupe, a cluster of drupelets (as in a blackberry) or a pome. Seeds with straight embryo; endosperm usually none.—In certain genera the calyx appears double by reason of a row of bractlets alternate with the calyx-lobes. Coleogyne and Lyonothamnus have opposite leaves.—Genera 90 and species about 1500, all continents but massed in the north temperate and boreal regions.

Bibliog.—Lindley, John, Observations on the natural group of plants called Pomaceae (Trans. Linn. Soc. 13:88–106, t. 8–11,—1822). Don, D., Description of Cowania, a new genus of plants * * * (Trans. Linn. Soc. 14:573–575, t. 22, figs. 1–6,—1825). Roemer, M. J., Rosiflorae (Synopses mongraphicae 3:1–249,—1847). Baillon, H., Rosaceae in The Natural History of Plants 1:335–471, figs. 373–503,—1871. Decaisne, M. J., Mémoire sur la famille des Pomacées (Nouv. Arch. Mus. Hist. Nat. Paris 10:113–192,—1874). Maximowicz, C. J., Adnotationes de Spiraeeis (Acta Horti Petrop. 6:i–xi, 105–261,—1879). Watson, S., On the genus Eriogynia (Bot. Gaz. 15:241–242,—1890). Greene, E. L., The genus Kunzia (Pitt. 2:298–299,—1892); The N. Am. Neilleae (Pitt. 2:25–31,—1889); Sieversia (Pitt. 4:48–50,—1899); An extension of Osmaronia (Pitt. 5:309–312,—1905); Segregates from Sieversia (Lflts. 1:174–179,—1906); Certain rosaceous genera (Lflts. 1:123–246,—1906). Bicknell, E. P., The N. Am. species of Agrimonia (Bull. Torr. Club 23:508–523, pls. 282–283,—1896). Koehne, E., Beiträge zur Kenntnis der Sorbus-Arten (Gartenfl. 50:406–412). Rydberg, P. A., Rosaceae in N. Am. Fl. 22:239–533,—1908; Notes on Rosaceae: I. Opulaster, Spiraea, Petrophytum, Luetkea, Aruncus (Bull. Torr. Club 35:535–542,—1908); II. Schizonotus, Chamaebatiaria, Sericotheca, Horkelia, Horkeliella, Ivesia, Comarella and Stellariopsis (36:397–407,—1909); III. Potentilla (37:375–386,—1910); IV. Potentilla, cont. (37:487–502,—1910); V. Potentilla, cont. (38:79–89,—1911); VI. Argentina, Comarum, Duchesnea, Fragaria, Sibbaldia, Sibbaldiopsis, Dasiphora, Drymocallis (38:351–367,—1911); VII. Alchemilla, Aphanes, Sanguisorba, Poteridium, Poterium, Acaena, Agrimonia, Adenostoma, Coleogyne (41:319–332,—1914); VIII. Dryas, Geum, Sieversia, Cowania, Fallugia, Kuntzia vs. Purshia, Chamaebatia, Cercocarpus (41:483–503,—1914); IX. Rubacer, Rubus (42:117–160,—1915); X. Rubus hybrids (42:463–479,—1915); XI. Roses of Cal. and Nev. (44:65–84,—1917). Bitter, G., Die Gatt. Acaena (Biblio. Bot. 17^{74}:1–336, tt. 1–37, figs. 1–98,—

1910–1911). Smith, C. P., Studies in the genus Erythrocoma (Muhl. 8:1–17, pls. 1–3,—1912). Palmer, E. J., Synopsis of N. Am. Crataegi (Jour. Arnold Arboretum 6:5–128,—1925). Darrow, G. M., Development of runners and runner plants in the strawberry (U. S. Dept. Agr. Tech. Bull. 122:1–28, figs. 1–14,—1929).

A. Ovary superior.

1. FRUIT DEHISCENT, CONSISTING OF 2 TO 5 DRY PODS OR FOLLICLES; TREES, SHRUBS OR HERBS.—Tribe SPIRAEAE.

Flowers perfect; trees or shrubs.
Calyx-lobes deciduous; leaves opposite; trees..........1. LYONOTHAMNUS.
Calyx-lobes persistent; leaves alternate; shrubs.
Stamens distinct; erect shrubs.
Leaves simple.
Pods inflated, 2 to 4-seeded; flowers white..........2. PHYSOCARPUS.
Pods not inflated.
Stamens well exserted; flowers mostly rose-color; pods several-seeded, dehiscent..........3. SPIRAEA.
Stamens scarcely exserted; flowers creamy-white; pods 1-seeded, tardily dehiscent or indehiscent..........4. HOLODISCUS.
Leaves compound, the leaflets minute..........5. CHAMAEBATIARIA.
Stamens united at base; leaves dissected; decumbent shrub..........6. LUETKEA.
Flowers dioecious; tall herb..........7. ARUNCUS.

2. FRUIT INDEHISCENT; SHRUBS OR HERBS.

a. Ovary becoming an achene (or drupelet in no. 8).—Tribe ROSEAE.

Pistils more than 1, commonly many to numerous; achenes more than 1.
Pistils becoming drupelets which are coherent on a convex receptacle and form a fruit called a "berry"; leaves compound or simple; shrubs or bushes..........8. RUBUS.
Pistils becoming dry achenes; leaves compound, or pinnately lobed.
Pistils borne on a flat or convex receptacle.
Bractlets present.
Style deciduous from the achene; receptacle conic; herbs (except one species in no. 10).
Receptacle fleshy; leaves 3-foliolate..........9. FRAGARIA.
Receptacle dry; leaves pinnate or palmate, the leaflets 4 to numerous, rarely 3..........10. POTENTILLA.
Style persistent on the achene.
Leaves pinnately compound; receptacle conic or hemispheric; achenes and styles strongly deflexed; herbs..........11. GEUM.
Leaves simple, pinnately lobed; receptacle flat; achenes and styles not deflexed; shrubs..........12. FALLUGIA.
Bractlets wanting; achene with a long feathery tail; leaves pinnately lobed; shrub.. 13. COWANIA.
Pistils disposed on the inside of a globose or urnshaped calyx-tube which is lined by a thin disk or receptacle, in fruit termed a "hip"; leaves pinnate; stems prickly.. 14. ROSA.

Pistil only one.
Leaves compound.
Low bush; leaflets numerous, minute..........15. CHAMAEBATIA.
Herbs.
Leaves pinnate.
Calyx prickly; perennials.
Petals yellow; prickles of calyx hooked at tip..........16. AGRIMONIA.
Petals none; prickles of calyx straight but retrorsely barbed..17. ACAENA.
Calyx not prickly; petals none; annuals or perennials..........18. SANGUISORBA.
Leaves palmately divided; petals none; diminutive annuals..........19. ALCHEMILLA.
Leaves simple; shrubs.
Achene with long feathery tail; petals none..........20. CERCOCARPUS.
Achene not tailed; leaves small, mostly fascicled.
Leaves entire, narrow.
Petals white; leaves needle-like; branches not spinescent..........21. ADENOSTOMA.
Petals none; leaves narrowly oblanceolate; branches spinescent.......... 22. COLEOGYNE.
Leaves cuneate, 3-toothed or -lobed above; petals pale yellow..........23. PURSHIA.

b. Ovary becoming a drupe; trees or shrubs with simple leaves and caducous stipules.—Tribe Drupeae.

Pistils 5; drupes 1 to 5; flowers dioecious........24. Osmaronia.
Pistil 1; drupe solitary; flowers perfect........25. Prunus.

B. Ovary inferior, 2 to 5-celled, enclosed in and mostly adherent to the fleshy calyx-tube; fruit a pome; trees and shrubs.—Tribe Pomeae.

Leaves compound; flowers in compound corymbs; fruit coral red, berry-like........26. Sorbus.
Leaves simple.
  Foliage evergreen, coriaceous; flowers small, numerous, in a corymbose panicle; fruit bright red, berry-like........27. Photinia.
  Foliage deciduous.
    Flowers in corymbs.
      Branches not thorny; styles united at base; fruit a pome........28. Pyrus.
      Branches with stout thorns; styles distinct; fruit drupe-like, containing 2 to 5 bony stones........29. Crataegus.
    Flowers not in corymbs; branches not thorny; fruit berry-like, containing several cartilaginous seeds.
      Flowers 1 to 3 in a sessile umbel; petals spreading; styles 2........30. Peraphyllum.
      Flowers several in a receme; petals erect; styles 5........31. Amelanchier.

1. LYONOTHAMNUS Gray

Evergreen tree with thin bark exfoliating in long loose strips and with opposite dimorphic petioled leaves. Flowers numerous in a much-branched terminal panicle. Calyx-lobes 5. Petals 5 and stamens 13 to 16, inserted on the margin of the woolly disk lining the hemispheric calyx-tube. Pistils 2, distinct, each with a spreading style and capitate stigma. Fruit consisting of two woody 4-seeded carpels dehiscent ventrally and partly dehiscent dorsally.—Species 1. (The sur-name of W. S. Lyon of Los Angeles, the discoverer, combined with Greek thamnos, shrub.)

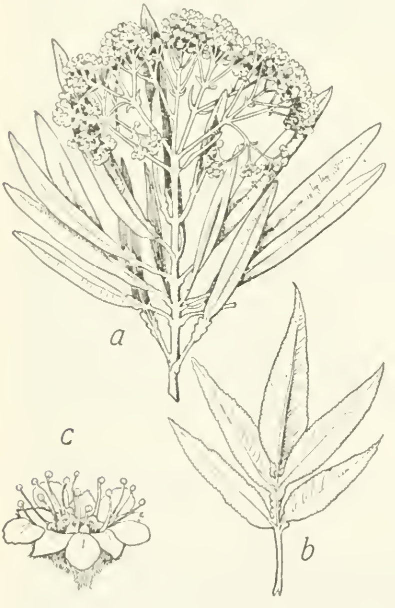

Fig. 158. Lyonothamnus floribundus Gray. *a*, fl. branchlet, × 1/6; *b*, "compound" leaf, × 1/8; *c*, fl., × 3.

1. **L. floribundus** Gray. Catalina Ironwood. (Fig. 158.) Slender tree 20 to 55 feet high, with narrow crown; leaves Oleander-like, linear, nearly entire or pinnately cut, petioled, 3 to 7 inches long, or often pinnately compound with 2 to 5 leaflets similar in shape and size to the simple leaves; flowers white, 3 lines broad, in terminal clusters 3 to 6 inches broad; petals orbicular, sessile, white, crenulate-edged.

Cañon walls, 500 to 2000 feet: Santa Catalina Isl. May-July.

Field note.—The leaves are dimorphic; in one form the leaf is lanceolate and essentially entire, that is, a simple leaf; in the other form the leaf is pinnately divided into 3 to 5 lanceolate pinnae 1½ to 4½ inches long, the pinnae regularly and deeply divided into broad obliquely obtuse segments 2 to 5 lines long (asplenioid). This latter form (here called "compound" for convenience) represents the var. asplenifolia Bdg. which is the only form found on Santa Cruz, Santa Rosa and San Clemente islands. On Santa Catalina, the first named or undivided type is found. Intergrades, however, between the two forms occur on Santa Catalina Island. These intergrades consist of the following states: (a), the simple lanceolate leaf has the basal part cut to the midrib into small lobes; (b), the simple lanceolate leaf is irregularly segmented throughout; (c), the simple lanceolate leaf is replaced by 2 to 5 pinnately arranged lanceolate segments, the segments similar in shape and size to the simple leaf, some of them often distinct or essentially so; (d), leaf "compound" as in *e*, with the segments more or less irregularly asplenioid. Finally the typical "asplenifolia" foliage may be found on Santa Catalina Island, though but rarely.

There are about a dozen groves of Lyonothamnus floribundus on the easterly end of Santa Catalina Island. They inhabit cañons and grow on rocky ledges, always near the sea. In Swain Cañon near Avalon we have examined three groves. The lower grove is on a sharp hillside about 200 feet above the cañon bottom and consists of trees 20 to 35 feet high. The trunks branch mostly in the top; they average 3 inches in diameter and are cylindric, but upwards show a tendency to become flattened or board-like, or triangular with three board-like wings, the longest diameters being 6 to 13 inches. It is only occasionally that the divided type of leaf is noted in this grove. Most of the original trees here were felled and the present stand represents crown-sprouts. Very young crown-sprouts may be seen about the bases of some of the trunks. The second or middle grove in Swain Cañon occupies the rocky south wall and grows partly in the cañon bottom. One tree is 55 feet high and 12½ inches in diameter at 2 feet above the ground. The trunks are flattened as in the lower grove. A third or upper grove is found in a branch of the cañon to the left of the middle cañon, going up. The trees are nearly as tall as in the middle grove (Jepson Field Book 19:14–18, in 1908, ms.).

In only two of the groves at the easterly end of Santa Catalina did Blanche Trask, the field student of the island, find "compound" leaves, "yet a tendency towards divided leaves and imperfectly divided leaves is everywhere present", the strictly entire leaf being the exception rather than the rule in most of the groves. At the westerly end of the island, the tree is much more common, that region being "a veritable Lyonothamnus land" (cf. Blanche Trask, Erythea 7:141–142). Every herbarium specimen of L. floribundus examined by us shows that all branchlets bear at least one leaf and usually several with partially divided blades. Nearly all leaves of the simple entire type show one or two reduced or supplementary lobes at base. The nearest approximation to a specimen with strictly entire leaves is one in which a few of the leaves show only minute supplementary lobes at the base of the main blade.

In 1884 W. S. Lyon of Los Angeles collected material of this species on Santa Catalina Island and sent it to Asa Gray who recognized the specimens as representing a new genus. That island had been visited previously by thousands of persons and undoubtedly many had observed and a number of them had gathered branches from these strange trees; but Lyon was the first to make the tree known to botanists and is properly regarded as its botanical discoverer. The genus is most closely allied to Vauquelinia Corr., especially through the species V. corymbosa Corr. and V. californica Sarg. Vauquelinia occurs in New Mexico, Arizona, Mexico and Lower California. The wood of Lyonothamnus is heavy, hard and strong. Our field notes show that it has been used for making fishing poles and canes.

Var. **asplenifolius** Bdg. Leaves regularly pinnately divided into 3 to 5 linear-lanceolate segments, the segments asplenioid-pinnatifid with numerous rounded lobes.—San Clemente, Santa Rosa and Santa Cruz islands. May-July.

Locs.—Frey's Harbor, Santa Cruz Isl., *A. L. Grant* 1735; Pelican Bay, Santa Cruz Isl., *Mason* 4109; San Clemente Isl., *E. A. Mearns* 4049; Santa Rosa Isl., *T. Brandegee.*

Refs.—LYONOTHAMNUS FLORIBUNDUS Gray, Proc. Am. Acad. 20:292 (1885), type loc. Santa Catalina Isl., *W. S. Lyon;* Jepson, Man. 478 (1925). Var. ASPLENIFOLIUS Bdg. Zoe 1:136, 111, pl. 5, figs. 8–13 (1890). *L. asplenifolius* Greene, Bull. Cal. Acad. 1:187 (1886), type loc. Santa Cruz Isl., *Barclay Hazard. L. floribundus* f. *asplenifolius* Franceschi; Bailey, Cyclop. Am. Hort. 961 (1900).

2. PHYSOCARPUS Maxim.

Deciduous shrubs with reddish-brown shreddy bark. Leaves simple; stipules deciduous. Flowers white, in corymbs terminating lateral leafy branchlets. Calyx-tube hemispheric. Calyx-lobes 5. Petals rounded, equal. Stamens 20 to 24. Pistils 1 to 5, mostly 3, somewhat united toward the base, becoming as many inflated 2 to 4-seeded pods dehiscent along both sutures. Seeds with copious endosperm.—Species 3, North America and Asia. (Greek phusa, bellows or bladder, and karpos, fruit.)

Stamens similar; carpels 3 to 5; cismontane........................1. *P. capitatus.*
Alternate stamens longer, their filaments with more dilated base; carpel 1; transmontane........ 2. *P. alternans.*

1. **P. capitatus** Ktze. NINE-BARK. Erect or straggly shrub 3 to 5 feet high; leaf-blades roundish or ovate, 3-lobed and irregularly serrate, glabrous, or stellate-pubescent beneath, 1 to 3 inches long, on petioles ½ to 1½ inches long; leaves of sterile shoots similar but larger; corymbs hemispherical, ¾ to 1 inch high; petals 1½ to 2 lines long; pods divergent, commonly 3 to 4 lines long.

Common along streams in the hills, or often gregarious on steep north slopes, 500 to 450 feet: Coast Ranges from the Santa Cruz Mts. to Siskiyou Co., 25 to 2500 feet, common; Sierra Nevada from Tulare Co. to Mt. Shasta, 1500 to 4500 feet, at scattered stations. North to British Columbia. Apr.-June.

Locs.—Coast Ranges: Alma, Santa Cruz Mts., *Pendleton* 722; Belmont, San Mateo Co., *Davy* 799; Berkeley, *Jepson* 8193; Paper Mill Creek, Marin Co., *Jepson* 8281; Santa Rosa, *Heller* 5647; Howell Mt., *Jepson* 13,847; Jackson Valley, Mendocino Co., *Jepson;* Long Valley, Mendocino Co., *Jepson;* Hydesville, Humboldt Co., *Tracy* 3270; Browns Creek, Trinity Co., *Yates* 389; Sisson, Siskiyou Co., *Jepson* 13,845; Trinidad, n. Humboldt Co., *Geo. Parrish;* Crescent City, Del Norte Co., *Parks* 3192. Sierra Nevada: Dorst Creek, Tulare Co., *W. Fry* 4; Millwood, Fresno Co., acc. *Hopping;* Italian Bar, Tuolumne Co., *Jepson* 6368; betw. Sheep Ranch and Mountain Ranch, Calaveras Co., *Davy* 1597; Jackson, Amador Co., *Hansen* 236; Little Chico Creek, Butte Co., *R. M. Austin;* Ash Creek, Mt. Shasta, *M. S. Baker.*

Refs.—PHYSOCARPUS CAPITATUS Ktze. Rev. Gen. Pl. 1:219 (1891); Jepson, Fl. W. Mid. Cal. ed. 2, 204 (1911), Man. 478, fig. 472 (1925). *Spiraea capitata* Pursh, Fl. 342 (1814), type from "North-west Coast" (of America), *Menzies. Neillia capitata* Greene, Pitt. 2:28 (1889). *Opulaster capitatus* Ktze. Rev. Gen. Pl. 2:949 (1891). *Opulaster opulifolius* var. *capitatus* Jepson, Fl. W. Mid. Cal. 276 (1901). *Spiraea opulifolia* var. *tomentella* Ser.; DC. Prod. 2:542 (1825), type loc. not stated. *Spiraea opulifolia* var. *b.* Hook. Fl. Bor. Am. 1:171 (1834). *Physocarpa tomentosa* Raf. New Fl. 3:74 (1838). *S. opulifolia* var. *mollis* T. & G. Fl. 1:414 (1840). *Neillia opulifolia* B. & W. Bot. Cal. 1:171 (1876), in part. *N. opulifolia* var. *mollis* B. & W. l.c.

2. **P. alternans** J. T. Howell var. **panamintensis** Jepson comb. n. Shrub 1 to 3 feet high; leaf-blades pubescent above, 1¼ to 2 lines long.

Rocky montane slopes, 7000 to 8500 feet: Panamint Range. June-July.

Var. **annulatus** Jepson comb. n. Inside of calyx-tube with a ring of hairs near the top.—White Mts.

Refs.—PHYSOCARPUS ALTERNANS J. T. Howell, Proc. Cal. Acad. 20:130 (1931). *Neillia monogyna* var. *alternans* Jones, Zoe 4:42 (1893), type loc. Schell Creek Mts., Nev., *Jones.* Var. PANAMINTENSIS Jepson. *P. alternans* subsp. *panamintensis* J. T. Howell, l.c. 20:132, type loc. saddle betw. Johnson and Surprise cañons, Panamint Range, *J. T. Howell* 3942. Var. ANNULATUS Jepson. *P. alternans* subsp. *annulatus* J. T. Howell, l.c. 20:133, type loc. Wyman Creek, White Mts., *Duran* 1682.

3. **SPIRAEA** L.

Shrubs with simple leaves, short petioles and no stipules. Flowers white or rose-color, small (about ¾ to 1½ lines long), numerous, crowded, in terminal corymbs, panicles or spikes. Stamens 10 to 50, much-exserted. Pods glabrous in ours, commonly 5, not inflated, few- to several-seeded.—Species about 40, north temperate zone. (Greek speira, a band, wreath.)

Erect shrubs; leaves not in rosettes, deciduous; follicles dehiscent ventrally.
  Flowers rose-pink, in narrow panicles; leaves white-tomentose beneath..............1. *S. douglasii.*
  Flowers pale purple, in corymbs; leaves glabrous or minutely puberulent.......2. *S. densiflora.*
Prostrate shrubs, somewhat herb-like, with evergreen leaves in close dense rosettes; flowers white, in dense cylindrical spikes; follicles dehiscent both ventrally and dorsally..........................3. *S. caespitosa.*

1. **S. douglasii** Hook. (Fig. 159.) Erect, 2 to 6 feet high, with stoutish branches and reddish-brown bark; leaf-blades oblong, serrate at apex, green above, white-tomentose beneath, 1 to 3 (or in shade even 4) inches long; panicles narrow, usually elongated, 2 to 5 inches long; calyx-lobes mostly reflexed; petals ovate.

Valley flats, meadows and along streams: Sierra Nevada from Plumas and Butte Cos. to Modoc Co., 2500 to 5000 feet; North Coast Ranges from Humboldt Co. to Siskiyou and Del Norte Cos., 25 to 5000 feet. North to British Columbia. July-Aug.

Locs.—Northern Sierra Nevada: Engels, Light Creek, Plumas Co., *Jepson* 8009; Prattville, Plumas Co., *R. H. Platt;* Jonesville, Butte Co., *Copeland* 374; Mineral, Tehama Co., *J. Grinnell;* Forestdale, sw. Modoc Co., *M. S. Baker.* North Coast Ranges: betw. Scotia and Fortuna, *M. S. Baker* 5; betw. Eureka and Arcata, Humboldt Co., *Jepson* 1924; Stuarts, Trinity Co., *H. S. Yates* 497; Sisson, Siskiyou Co., *Jepson* 13,855; betw. Igerna and Weed, Siskiyou Co., *Heller* 8085; Log Lake, Shackelford Creek, Siskiyou Co., *Butler* 284; Crescent City, *Jepson* 9395a.

Refs.—SPIRAEA DOUGLASII Hook. Fl. Bor. Am. 1:172 (1834), "Northwest Coast of America about the Columbia and Straits of Juan de Fuca," *Douglas;* Jepson, Man. 478 (1925). *S. nobleana* Hook. Bot. Mag. t. 5169 (1860), cultivated from Douglas seed, type locality not stated. *S. douglasii* var. *nobleana* Wats. Bot. Cal. 1:169 (1876).

2. **S. densiflora** Nutt. Erect, 1 to 3 feet high with reddish bark; leaf-blades elliptic to ovate, sharply and often unequally serrate, but entire towards the rounded base, ⅝ to 1 (or 2½) inches long; corymbs terminal, roundish, ¾ to 2 inches broad; calyx-lobes erect; petals roundish-obovate.

Rocky mountain slopes or ridges, often in clefts of granite rocks, 4800 to 9000 (or 11,000) feet: Sierra Nevada from Tulare Co. to Lassen Peak; Mt. Shasta; Humboldt and Trinity Cos. to Siskiyou Co. North to British Columbia. July-Aug.

Locs.—Sierra Nevada: Twin Lakes, Tulare Co., *W. Fry;* Alta Peak, *Newlon* 28; Piute Pass, Inyo Co., acc. *Peirson;* Bald Mt. above Shavers Lake, Fresno Co., *A. L. Grant* 1183; Huntington Lake, *Jepson* 12,979; Lake Merced, Merced River, *Jepson* 3208; Matterhorn Cañon, Tuolumne Co., *Jepson* 4499; Kennedy Lake, Tuolumne Co., *A. L. Grant* 469; Silver Valley, Alpine Co., *Jepson* 10,145; Mt. Tallac, Lake Tahoe, *Jepson* 8138; Summit sta., Nevada Co., *Jepson* 13,854; Silver Lake, Lassen Co., *Baker & Nutting;* Lassen Peak, *R. M. Austin;* Ash Creek, Mt. Shasta, *M. S. Baker.* North Coast Ranges: Horse Mt., Humboldt Co., *Tracy* 7630; Deadfall Creek, Trinity Co., *Alexander & Kellogg;* Shackelford Creek, Siskiyou Co., *Butler* 277.

Refs.—SPIRAEA DENSIFLORA Nutt.; T. & G. Fl. 1:414 (1840), as synonym, collected by Nuttall, type loc. not stated but Blue Mts., Ore., acc. Rydberg, N. Am. Fl. 22:248; Greenman, Bot. Gaz. 25:261 (1898); Jepson, Man. 478, fig. 473 (1925). *S. betulaefolia* Pallas, Fl. Ross. 1:33, t. 16 (1784). *S. betulaefolia* var. *rosea* Gray, Proc. Am. Acad. 8:381 (1873), type loc. Oregon, *Elihu Hall. S. lucida* var. *rosea* Greene, Pitt. 2:221 (1892). *S. arbuscula* Greene, Erythea 3:63 (1895). *S. splendens* Baumann; K. Koch, Monats. Ver. Bef. Gart. Preuss. 18:294 (1875), type from Cal. *S. helleri* Rydb. N. Am. Fl. 22:248 (1908), type loc. Summit sta. (Donner Pass), Nevada Co., *Heller* 7022.

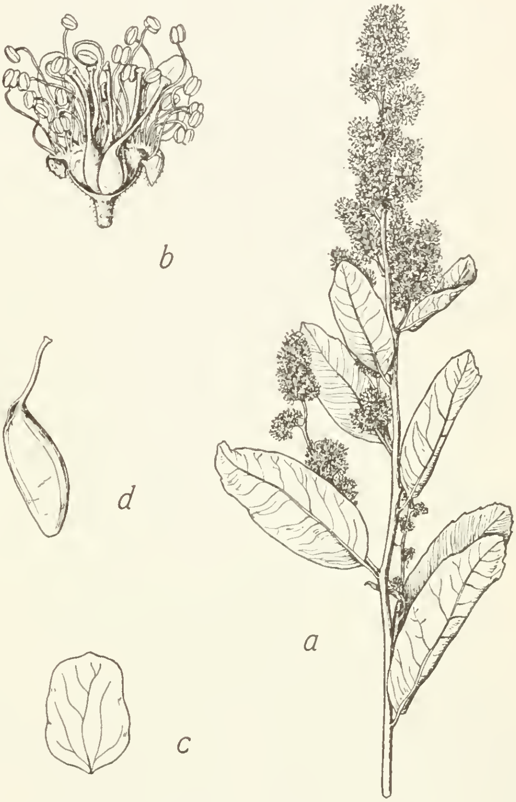

Fig. 159. SPIRAEA DOUGLASII Hook. *a*, flowering branchlet, × ½; *b*, long. sect. of fl., × 7; *c*, petal, × 10; *d*, fr., × 7.

3. **S. caespitosa** Nutt. Root-crown compactly branched, woody, densely clothed with rosulate tufts of leaves and forming mats ¼ to 3 feet broad; flowering stems ascending, 2½ to 6 inches high; scape-like, with few small leafy bracts; leaves oblong-obovate, entire, acute, densely silky, 2 to 6 lines long; spikes ½ to 2 inches long; calyx densely tomentose; petals oblong-oblanceolate, obtuse.

Limestone rocks in desert ranges, 4000 to 8000 feet: Providence Mts.; Panamint Range; southeast end of the Sierra Nevada. East to the Rocky Mts., north to southern Oregon. May.

Locs.—Providence Mts., *T. Brandegee;* Panamint Cañon, Inyo Co., *Hall & Chandler* 7010; Big Arroyo, Tulare Co. Nevada: Miller Mt., Mineral Co., *Shockley;* Lee Cañon, Charleston Mts., *Heller* 11,064.

Refs.—SPIRAEA CAESPITOSA Nutt.; T. & G. Fl. 1:418 (1840), type loc. sources of the Platte (River), Rocky Mts., *Nuttall;* Jepson, Man. 479 (1925). *Eriogynia caespitosa* Wats. Bot. Gaz. 15:242 (1890). *Luetkea caespitosa* Ktze. Rev. Gen. Pl. 1:217 (1891). *Petrophytum caespitosum*

Rydb. Mem. N. Y. Bot. Gard. 1:206 (1900). *P. acuminatum* Rydb. N. Am. Fl. 22:253 (1908), type loc. Big Arroyo, Tulare Co., *Culbertson* 4540, herbage sparingly strigose, calyx-lobes acuminate, petals acute or acuminate.

4. HOLODISCUS Maxim.

Deciduous shrubs with toothed or lobed leaves and no stipules. Flowers creamy-white, small, numerous in terminal panicles. Petals 5, rounded. Stamens 20, on a ring-like perigynous disk. Pistils 5, distinct. Pods short-stipitate, hairy, 1-seeded, tardily dehiscent or indehiscent. Ovules 2, pendulous.—Species 2, western North America. (Greek holo, whole, and diskos, a disk, some related genera with lobed disks.)

1. **H. discolor** Maxim. CREAM BUSH. (Fig. 160.) Shrub 3 to 6 or sometimes 14 feet high; leaf-blades ovate to ovate-elliptic, coarsely serrate or incised above the entire broadly cuneate (or sometimes subtruncatish) base, green and slightly pubescent above, paler and pubescent beneath with soft hairs, ¾ to 3 inches long; petioles 2 to 6 lines long; panicles ample, 3 to 8 inches long, often half drooping in anthesis; flowers 1½ lines long; follicles about 1 line long.

Cañons in the hills, 5 to 5000 feet: along the coast from Los Angeles Co. to Siskiyou Co.; occasional in the Sierra Nevada. North to British Columbia, east to the Rocky Mts. May-July.

Geog. note.—Holodiscus discolor consists of an assemblage of forms, numerous and varied, without definite geographic segregation, and best represented as a reticulation. The original of the species from Idaho has slightly pubescent rather large thin leaf-blades which are usually but not always decurrent on the petiole. In California it tends to become more shortly petioled with thicker and smaller leaves which are often more densely pubescent beneath. Specimens from the following stations illustrate its occurrence. Coast Ranges: Requa, mouth of Klamath River, *Goddard* 172; Humbug, Siskiyou Co., *Butler* 494; betw. Willow Creek and Three Creeks, n. Humboldt Co., *Jepson* 2125; Van Duzen River valley, opp. Buck Mt., *Tracy* 2927; Bennett Spr., w. Glenn Co., *Heller* 11,545; Calistoga, *Jepson* 9973; Crockett, Contra Costa Co., *Tidestrom;* San Mateo, *Elmer* 4274; Los Gatos, *Heller* 7514; Los Angeles, *Braunton* 462.

The following forms, here described reluctantly as varieties, are represented by a few typical states and by others less typical, all of which intergrade with each other and with the species.

Var. **franciscanus** Jepson comb. n. Leaf-blades thick, white-silky or tomentose beneath, more pubescent above than in the species, commonly rounded or truncate at base, 1 to 2¼ inches long, not decurrent on the petiole; petioles 1 to 5 lines long; panicles typically large and dense.—Coast Ranges from Del Norte Co. to Santa Cruz Co., and in coastal S. Cal.: Ragged Hill, s. of Crescent City, *Jepson* 9403; Mt. Tamalpais, *Jepson* 13,860; Oakland Hills, *Jepson* 6815; Saratoga, Santa Cruz Mts., *Jepson* 5629; Pettit Cañon, San Luis Obispo, *Condit;* Santa Anita Cañon, San Gabriel Mts., *Peirson* 75. In addition there are numerous intergrades towards the species: leaf-blades densely tomentose but decurrent on petiole (Hupa, n. Humboldt Co., *Chandler* 1314, Pacific Grove, *Tidestrom,* and Santa Cruz Isl., *T. Brandegee*); blades small, pubescent beneath, not decurrent (Mt. Diablo, *Jepson* 7582); leaves smaller, panicles medium (Glenbrook, Lake Co., *Jepson* 13,859), and also intergrades to the next variety.

Var. **microphyllus** Jepson comb. n. Small or dwarfed shrub 1 to 3 (or 4) feet high; leaf-blades spatulate-cuneate or ovoid-flabelliform, decurrent or not decurrent, green and villous above, pale and villous or white-silky beneath, 4 to 10 lines long, the petioles ½ to 2 lines long, or the leaves subsessile; panicles small, narrow (½ to 2 or rarely 3 inches long).—Exposed rocky ridges, cañon floors and open forests in the mountains, 7000 to 11,000 feet: North Coast Ranges; Sierra Nevada from Butte Co. to Tulare Co.; White Mts.; Southern California mountains.

Locs.—North Coast Ranges: Mt. Sanhedrin, *W. P. Taylor;* Little Red Mt., n. Mendocino Co., *Jepson* 16,506. Sierra Nevada: Colby, Butte Co., *R. M. Austin;* Summit sta., Nevada Co., *Jepson* 13,857; Glen Alpine, Eldorado Co., *Katherine Chandler;* Carson Pass, *Jepson* 8102; Silver Creek Valley, Alpine Co., *Brewer* 1974; Kennedy Mdw., East Fork Relief Creek, Tuolumne Co., *A. L. Grant* 185; Stubblefield Cañon, Tuolumne Co., *Jepson* 4573; Lake Eleanor, Tuolumne Co., *Chesnut & Drew;* Silver Pass, Fresno Co., *A. L. Grant* 1528; Kearsarge Mill to Rex Montis Mine, w. Inyo Co., *Jepson* 892; Mt. Whitney, *Burton & Ryerson* 33; Coyote Pass, Sawtooth Range, *Jepson* 985; Trout Mdws., Tulare Co., *Purpus* 1854; North Fork Middle Tule River, *Jepson* 4690. White Mts.: Silver Cañon, *Jepson* 7213 (leaves slightly glandular, panicles very ample). S. Cal.: Providence Mts., Mohave Desert, *T. Brandegee;* Mt. Pinos, n. Ventura Co., *Hall* 6673; Mt. San Antonio, San Gabriel Mts., *Peirson* 76; Bluff Lake, San Bernardino Mts., *Munz* 10,573; Mt. San Jacinto, *A. W. Anthony.*

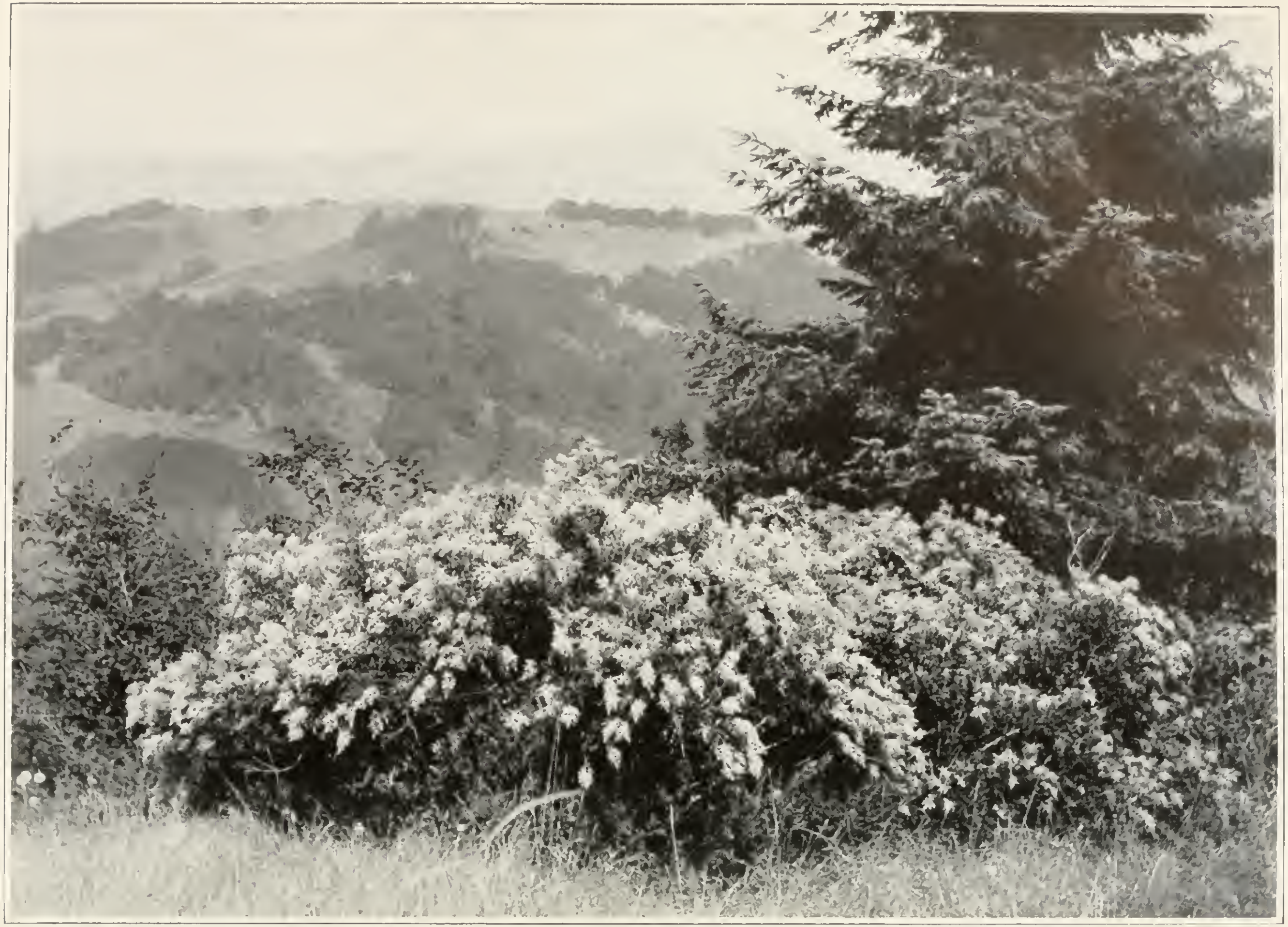

Fig. 160. Holodiscus discolor Maxim. Shrub 5 feet high, on summit between Willow Creek and Berry's ranch, northern Humboldt County. Pseudotsuga taxifolia Britt. at right, Quercus garryana Dougl. forming groves on the hill slopes in background. (P. E. Goddard and W. L. Jepson, photo. in July, 1902.)

A state of var. microphyllus with leaves slightly wider and broadly cuneate or rounded at base is the trifling form H. saxicola Hel.: South Yollo Bolly, *Jepson* 13,858; Trinity Summit, n. Humboldt Co., *Davy* 5853; Silver Lake, Amador Co., *Earl Mulliken* 148; Kennedy Mdws., East Fork Relief Creek, Tuolumne Co., *Jepson* 6549; Round Mdw., Giant Forest, *Jepson* 688.

Var. **glabrescens** Jepson. Diffuse, 1 to 4 feet high; leaf-blades cuneate-obovate, sparingly pubescent or sometimes very hairy, glandular-dotted (especially beneath), 3 to 7 lines long, decurrent on the short (½ to ¾ line) petioles.—Rocky slopes, 3600 to 9400 feet: easterly slopes or east side of the Sierra Nevada from Placer Co. to Modoc Co., thence west to Siskiyou Co. North to Oregon, east to Utah. July-Sept.

Locs.—Truckee River, Placer Co., *Sonne;* Brokeoff Mt., Tehama Co., *J. Grinnell;* Lassen Peak, *Jepson* 15,327; Martin Sprs., Eagle Lake, *Brown & Wieslander* 60; Lost Lake, Warner Mts., *L. S. Smith* 1029; Eagle Peak, Warner Mts., *Jepson* 7962; Mt. Bidwell, ne. Modoc Co., *Jepson* 7875; Lava ranger sta., w. Modoc Co., *L. S. Smith* 1448; Mt. Shasta, *Jepson* 13,856; Humbug Mt., w. Siskiyou Co., *Butler* 495; Log Lake, Shackelford Creek, w. Siskiyou Co., *Butler* 283.

The type locality of var. dumosus Dippel is in Colorado. That form, in this treatment, is excluded from the California flora.

Refs.—HOLODISCUS DISCOLOR Maxim. Acta Hort. Petrop. 6:254 (1879); Jepson, Man. 479, fig. 474 (1925) in part. *Spiraea discolor* Pursh, Fl. 342 (1814), type loc. "banks of the Kooskoosky" (Clearwater River, Idaho), *Lewis. Schizonotus discolor* Raf. New Fl. 3:75 (1836). *Sericotheca discolor* Rydb. N. Am. Fl. 22:262 (1908). *Spiraea ariaefolia* Smith; Rees, Cycl. 33: Spiraea no. 16 (1819), type loc. "northwest coast of America," *Menzies. Schizonotus ariaefolius* Greene, Fl. Fr. 58 (1891), in part. *Holodiscus ariaefolius* Greene, Man. Reg. S. F. Bay 113 (1894). *Spiraea discolor* var. *ariaefolia* Wats. Bot. Cal. 1:170 (1876). *Schizonotus argenteus* var. *ariaefolius* Ktze. Rev. Gen. Pl. 1:225 (1891). *S. argenteus* var. *discolor* Ktze. l.c. *H. discolor* var. *ariaefolius* Jepson, Fl. W. Mid. Cal. 277 (1901), in part, ed. 2, 204 (1911), in part. *Schizonotus discolor* var. *purshianus* Rehd.; Bailey, Cycl. Am. Hort. 4:1627 (1902). Var. FRANCISCANUS Jepson. *Sericotheca franciscana* Rydb. N. Am. Fl. 22:262 (1908), type loc. San Leandro, *L. M. Underwood. Holodiscus franciscanus* Rehd. Jour. Arn. Arb. 1:260 (1920). *Spiraea discolor* B. & W. Bot. Cal. l.c., in part; not S. discolor Pursh (1814). *Schizonotus ariaefolius* Greene, Fl. Fr. 58 (1891), in part. *Holodiscus ariaefolius* Greene, Man. Reg. S. F. Bay 113 (1894), in part. *H. discolor* var. *ariaefolius* Jepson, Fl. W. Mid. Cal., l.c., in part, ed. 2, l.c., in part. *Holodiscus discolor* Jepson, Man. 479 (1925), in part. Var. MICROPHYLLUS Jepson. *Holodiscus microphyllus* Rydb. Bull. Torr. Club 31:559 (1904), type loc. Alta, Wasatch Mts., Utah, *Jones* 1142. *Sericotheca microphylla* Rydb., N. Am. Fl. 22:264 (1908). *Spiraea discolor* var. *dumosa* Wats. l.c., in part. *Holodiscus discolor* var. *dumosus* Jepson, Man. 479 (1925). *Holodiscus saxicola* Hel. Muhl. 1:41 (1904), type loc. Donner Pass, Nevada Co., *Heller* 7160. *Sericotheca saxicola* Rydb. N. Am. Fl. 22:263 (1908). *Spiraea boursieri* Carr. Rev. Hort. 520 (1859), type from Cal. *Holodiscus boursieri* Rehd.; Bailey, Cycl. Hort. 3:1498 (1915). *Sericotheca boursieri* Rydb. N. Am. Fl. 22:263 (1908). *Sericotheca concolor* Rydb. l.c. 264, type loc. Mt. Davidson, Nev., *Torrey* 134 (leaves almost equally pubescent on both sides). Var. GLABRESCENS Jepson, Man. 479 (1925). *Spiraea discolor* var. *glabrescens* Greenman, Erythea 7:116 (1899), type loc. Stein's Mt., Ore., *Cusick* 1253, 1968. *S. dumosa* Torr.; Stansbury, Expl. Great Salt Lake 387, pl. 4 (1852); not S. dumosa Nutt. (1840). *Holodiscus glabrescens* Hel. Muhl. 1:40 (1904). *Sericotheca glabrescens* Rydb. N. Am. Fl. 22:265 (1908). *Sericotheca obovata* Rydb. l.c. 264, type loc. along Truckee River, Placer Co., *Sonne* (leaves larger, villous-pubescent above).

5. CHAMAEBATIARIA Maxim.

Glandular-pubescent and aromatic deciduous shrub. Leaves pinnate, the pinnae pinnately divided into numerous almost distinct minute leaflets. Stipules entire. Flowers large, white, in a terminal racemose panicle. Stamens about 30 to 50, included. Pods 5, coriaceous, several-seeded, dehiscent down the ventral suture and half way down the back.—Species 1. (Resembles Chamaebatia.)

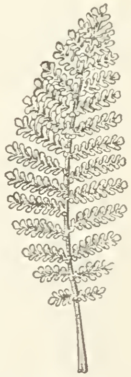

Fig. 161. CHAMAEBATIARIA MILLEFOLIUM Maxim.; a decompound xerophilous leaf type, × 1⅓.

1. **C. millefolium** Maxim. DESERT-SWEET. (Fig. 161.) Stout, erect, branching, 2½ to 6 feet high; herbage very fragrant; axis of inflorescence and pedicels heavily glandular, the foliage less glandular, sparingly soft-pubescent; leaves oblong-lanceolate in outline, 1 to 1¾ inches long; flowers 4 to 6 lines broad; petals orbicular; pods 2½ lines long.

Rocky desert slopes, 3400 to 9500 feet: east slope of the Sierra Nevada from Inyo Co. to Shasta Co.; Panamint Range; White Mts.; Warner Mts. North to southern Oregon, east to Wyoming and Arizona. June-Aug.

Locs.—Telescope Peak, Panamint Range, *Jepson* 7025; Timosea Peak, Inyo Co., *Jepson* 5081; Kearsarge Mill, w. of Independence, *Jepson* 874; Silver Cañon, White Mts., *Jepson* 7408; Deadman's Creek, Mono Co., *Congdon;* Dana (lava fields ne. of), ne. Shasta Co., *Jepson* 5765; McArthur, Shasta Co., *Kate Stirring;* Black Knob, Modoc Co., *L. S. Smith* 1012.

Refs.—CHAMAEBATIARIA MILLEFOLIUM Maxim. Acta Hort. Petrop. 6:225 (1879); Jepson, Man. 480, fig. 475 (1925). *Spiraea millefolium* Torr. Pac. R. Rep. 4:83 (1857), type loc. Williams Mts., Ariz., *Bigelow. Chamaebatia foliolosa* Newberry, Pac. R. Rep. 6:73 (1857), not Benth. *Sorbaria millefolium* Focke; Engler & Prantl, Nat. Pflzfam. 3^3:16 (1888). *Basilima millefolium* Greene, Fl. Fr. 57 (1891). *Chamaebatiaria glutinosa* Rydb. N. Am. Fl. 22:258 (1908), type loc. Ellsworth, Nye Co., Nev., *M. B. Howard. Spiraea glutinosa* Fedde, Just Bot. Jahrb. 36^2:489 (1910).

6. LUETKEA Bong.

Low herb-like plant, the woody stems decumbent or creeping, the flowering stems erect, ending in a raceme. Leaves biternately parted into linear lobes. Stamens about 20; filaments united at base. Pistils 5 (or 4 or 6). Pods coriaceous, 2-valved. —Species 1. (Count F. P. Luetke, 1797–1882, commander of a Russian exploring expedition in the arctic.)

1. **L. pectinata** Ktze. PARTRIDGE FOOT. Flowering stems 4 to 5 inches high; herbage glabrate; leaves 5 to 7 lines long, including the broad petiole; racemes ½ to 2½ inches long; flowers 3 to 3½ lines broad; petals white, orbicular or roundish-ovate.

High slopes where winter snow-banks have melted, often carpeting the ground along streams or about springs, 7000 to 9000 feet: Siskiyou Co. North to Alaska. Aug.

Locs.—Mt. Shasta (N. Am. Fauna 16:149); summit above Cold Spr., w. fork Woolly Creek, Siskiyou Co., *Butler* 223.

Refs.—LUETKEA PECTINATA Ktze. Rev. Gen. Pl. 1:217 (1891); Jepson, Man. 480 (1925). *Saxifraga pectinata* Pursh, Fl. 312 (1814), type loc. "Northwest Coast," *Menzies. Luetkea sibbaldioides* Bong. Veg. Sitch. 130, t. 2 (1832). *Eriogynia pectinata* Hook. Fl. Bor. Am. 1:255 (1834). *Spiraea pectinata* T. & G. Fl. 1:417 (1840).

7. ARUNCUS L. GOAT'S BEARD

Tall perennial herbs. Leaves two or three times pinnate, without stipules. Flowers white, dioecious, borne in long slender spikes, the spikes disposed in a large compound panicle. Follicles usually 3, at length reflexed, commonly 2-seeded.—Species 2, North America, Europe, and Asia. (Latin aruncus, the beard of a goat, says Pliny.)

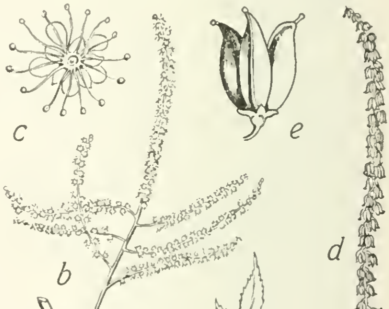

Fig. 162. ARUNCUS SYLVESTER Kost. var. ACUMINATUS Jepson. *a*, leaf, × ⅛; *b*, part of infl., × ¼; *c*, fl., × 2; *d*, fr. spike, × ½; *e*, fr. carpels, × 2.

1. **A. sylvester** Kost. var. **acuminatus** Jepson comb. n. GOAT'S BEARD. (Fig. 162.) Stems erect, 2 to 5 feet high, herbage glabrous; leaflets thin, ovate or oblong-lanceolate, irregularly serrate, acuminate, 1½ to 5 inches long; flowers 1 line wide; petals obovate; stamens much exserted.

Along shady streams in cañons, 500 to 4800 feet: northern Humboldt Co.; Trinity, Shasta, Siskiyou and Del Norte Cos. North to Alaska. May-Aug.

Locs.—Redwood Creek, e. of Trinidad, Humboldt Co., *Tracy* 4749; Martin ranch, South Fork Trinity River, Trinity Co., *Jepson* 2011; Slate Creek, Sacramento River, Shasta Co., *Brewer* 1446; Hurdy Gurdy Creek, Del Norte Co., *M. S. Baker* 299c; Log Lake, Shackleford Creek, Siskiyou Co., *Butler* 280.

Refs.—ARUNCUS SYLVESTER Kost. Ind. Hort. Prag. 15 (1884); Jepson, Man. 480 (1925). *Spiraea aruncus* L. Sp. Pl. 490 (1753), type from Austria. Var. ACUMINATUS Jepson. *Spiraea acuminata* Dougl.; Hook. Fl. Bor. Am. 1:173 (1834), as synonym, type loc. mouth of the Columbia River, *Douglas*. *Aruncus acuminatus* Rydb. N. Am. Fl. 22:255 (1908).

8. RUBUS L.

Ours bushes, either prickly or unarmed, the stems erect, or long and trailing, or climbing. Leaves simple, or pinnately compound with 3 to 5 leaflets. Bractlets wanting. Calyx-lobes 5. Petals 5. Stamens numerous. Pistils many, crowded on an elevated receptacle, becoming drupelets which are united to each other and form the aggregate fruit called a blackberry or raspberry.—Species about 300, all continents but chiefly in the forested regions of the north temperate zone and in the high mountains of tropical America. (Latin name, allied to ruber, red.)

Bibliog.—Focke, W. O., Species Ruborum. Monographiae generis Rubi prodromus (Biblio. Bot. 17^{72}:1–223,—1910–11; 19^{83}:1–274,—1914). Berger, Alwin, The systematic botany of the edible brambles, in "The small fruits of New York" (N. Y. State Agr. Exp. Sta. Rep. 1925, part 2:23–85,—1925).

Shrubs.
  Fruit conical or hemispherical, concave beneath, the drupelets parting from the receptacle as a whole when ripe.
    Stems unarmed; leaves simple, palmately lobed........................1. *R. parviflorus.*
    Stems prickly; leaves 3-foliolate.
      Flowers red; leaves pubescent or silky beneath........................2. *R. spectabilis.*
      Flowers white; leaves white-tomentose beneath........................3. *R. leucodermis.*
  Fruit oblong, the drupelets persistent upon the receptacle; leaves mostly 3 to 5-foliolate, a few simple; stems and leaves very prickly........................4. *R. vitifolius.*
Herbs; stems trailing, unarmed; leaves 3 (seemingly 5) -foliolate........................5. *R. pedatus.*

1. **R. parviflorus** Nutt. THIMBLE-BERRY. Stems erect, 3 to 6 feet high; bark eventually shreddy; leaves deciduous, the blades circular in outline, palmately 5-lobed, cordate at base, unequally serrate, 3 to 7 inches broad, puberulent to almost glabrous, the petioles and stems hispidulose and more or less glandular; flowers about 4 to 7 in terminal corymbs, white (rarely pinkish), 1 to 3 inches broad; calyx-lobes 5, sometimes 6 or 7, ovate, terminated by a tail-like or sometimes foliaceous appendage; petals of the same number as the calyx-lobes, elliptic; berry scarlet, 6 to 8 lines broad.

Common along cañon streams and in open woods: Southern California mountains and Sierra Nevada, 2300 to 7000 feet; hill country near the coast, 50 to 2000 feet. North to Alaska, east to Michigan and New Mexico. Apr.-July.

Note on variation.—Rubus parviflorus is, within California, constant in habit and in essential characters but variable as to amount of leaf pubescence. The form (a) with nearly glabrous leaves, occurring beyond our borders in the Great Basin, enters California in Modoc Co. (Lake City cañon, *Austin & Bruce*). A slightly pubescent form (b) ranges, at 2300 to 7000 feet, south in the Sierra Nevada (Colby, Butte Co., *R. M. Austin;* Lincoln Valley, Sierra Co., *Kennedy* 191; Truckee, *Sonne* 73; Gold Run, Placer Co., *K. Brandegee;* Amador Co., *Hansen;* Calaveras Big Trees, *Brewer* 1606; Yankee Hill, Tuolumne Co., *A. L. Grant* 670; Yosemite, *Alice King;* Huntington Lake, *A. L. Grant* 1416; Mt. Moses, Tulare Co., *Purpus* 1347) to the Tehachapi Mts. (*Greene*), and the Southern California mountains (Waterman Cañon, San Bernardino Mts., *Parish* 11,398; Dark Cañon, San Jacinto Mts., *Jepson* 2278), and from Modoc Co. west to Shasta Co. (Bartles, *M. S. Baker*), Mt. Shasta (Cedar Spr., *Jepson* 13,879), the high North Coast Ranges (Humbug Mt., Siskiyou Co., *Butler* 1438; Balm of Gilead Creek, se. Trinity Co., *Cronemiller* 699) and the coast of Del Norte Co. (Crescent City, *Shockley*). Shrubs with slightly more leaf pubescence (c), in indefinitely numerous and varying degrees, occur in the Sierra Nevada (Pleasant Valley, Piute Creek, Tuolumne River, *Jepson* 3394) and Southern California mountains (Santa Inez Mts.; Little Rock Creek, San Gabriel Mts., *Peirson* 1958; Deep Creek, San Bernardino Mts., *Chandler;* Bear Valley, San Bernardino Mts., *Munz* 10,541; Strawberry Valley, San Jacinto Mts.; Cootca, Palomar Mt., *Jepson* 1510) and Coast Ranges (Sisson, Siskiyou Co., *H. E. Brown* 312; North Fork Coffee Creek, Trinity Co., *Alexander & Kellogg* 233; Trinidad, n. Humboldt Co., *Geo.*

Parrish: Eureka, *Tracy* 799; Comptche, Mendocino Co., *H. A. Walker* 273). The most pubescent form (d), having leaves velvety to the touch on the under side and the young shoots, petioles and pedicels more pubescent with spreading hairs (var. velutinus Greene), occurs mostly in the coastal region, 10 to 2000 feet, from the northern to the southern limits of the state and reaches its highest development or center of distribution in the central coast region (Ft. Bragg, *W. C. Mathews* 104; Mendocino City, *Bolander* 4774; Pt. Reyes, *Davy* 6873; Mt. Tamalpais, *Chandler* 270; Berkeley, *Jepson;* Alpine School, San Mateo Co., *Elmer* 4294; Brookdale, Santa Cruz Mts., *Elsie Zeile;* Little Arthur Creek, w. of Gilroy, *Jepson* 9680; San Juan, San Benito Co., *Brewer* 718; Davis Cañon, San Luis Obispo, *Condit*), and in a usually less velvety form northward (Brannan Mt., Humboldt Co., *Tracy* 3432) and southward (Palomar Mt., San Diego Co., *T. Brandegee*).

The degree of pubescence on the leaves has only an obscure relation to the geographic distribution of Rubus parviflorus varieties within the state. The lightly pubescent form occurs mainly in the Sierra Nevada, high mountains of cismontane Southern California and in the northerly part of the North Coast Range area. The velvety form is most marked in the central coast region. The intermediate form is probably absent from the southern Sierra Nevada but occurs elsewhere in the range of the species in California, though absent from or infrequent in the South Coast Ranges. Intergrades are so numerous and represent differences so slight in degrees of pubescence that essentially equivalent specimens might readily be referred to different categories. It is incredible that on the basis of pubescence any two segregations, by independent investigators, would give the same result. And yet the two extremes stand: the almost glabrous type in northeastern Modoc Co., markedly different in pubescence from the extremely velvety form of the San Francisco Bay region.

Refs.—RUBUS PARVIFLORUS Nutt. Gen. 1:308 (1818), type loc. "Island of Michilimackinac, Lake Huron"; Jepson, Fl. W. Mid. Cal. ed. 2, 206 (1911), Man. 481, fig. 476 (1925). *R. nutkanus* Moc.; DC. Prod. 2:566 (1825), type from Nootka, Vancouver Isl., *Mocino*. *R. nutkanus* var. *nuttallii* T. & G. Fl. 1:450 (1840). *Rubacer parviflorum* Rydb. Bull. Torr. Club 30:274 (1903). *Bossekia parviflora* Greene, Lflts. 1:211 (1906). *Rubus nutkanus* var. *parviflorus* Focke, Biblio. Bot. 17:124 (1911). *R. nutkanus* var. *scopulorum* Greene; Focke, Biblio. Bot. l.c., type loc. southern Colorado, leaves nearly glabrous, some of the glands sometimes subsessile. Var. VELUTINUS Greene, Bull. Torr. Club 17:14 (1890); Jepson, Fl. W. Mid. Cal. 279 (1901). *Rubus velutinus* H. & A. Bot. Beech. 140 (1832), type loc. San Francisco, *Lay & Collie;* not R. velutinus Vest (1823). *R. nutkanus* var. *velutinus* Brew.; B. & W. Bot. Cal. 1:172 (1876). *Rubacer tomentosum* Rydb. Bull. Torr. Club 30:274 (1903). *Rubacer velutinus* Hel. Muhl. 1:106 (1904).

2. **R. spectabilis** Pursh. SALMON-BERRY. Stems erect, 3 to 9 feet high, with reddish-brown bark and sparingly armed, or the canes (sterile shoots) very prickly; prickles short, straight; young stems, petioles and midribs and veins of blades puberulent; leaves 3-foliolate, deciduous; leaflets ovate, doubly serrate, often more or less lobed, 1 to 3½ inches long; flowers 1 to 3 in a cluster, 1 to 1¾ inches broad; petals red; berry ovoid, red or yellow, glabrous, 7 to 9 lines broad.

Margins of woods and along streams, mostly in the vicinity of the ocean, 5 to 900 feet: Mendocino Co. to Humboldt Co. North to Alaska. Apr.-May.

Locs.—San Francisco, *Alice King;* betw. Scotville and Kenny's, nw. Mendocino Co., *Jepson* 2208; Eureka, *Tracy* 1001; Berry's ranch, Redwood Creek, n. Humboldt Co., *Tracy* 6192.

Var. **menziesii** Wats. Leaves silky-pubescent beneath or merely villous.—Santa Cruz Mts. to Humboldt Co. Apr.-May. In the northerly part of its range this form is less common than the species.

Locs.—Pilarcitos Creek, San Mateo Co., *Davy* 1061; Spanish Town, San Mateo Co., *Elmer* 4788; Olema, Marin Co., *Jepson;* Pt. Reyes, *Greene;* Stewarts Pt., Sonoma Co., *M. S. Baker;* Russian River (at mouth), *M. S. Baker;* Scotia, Humboldt Co., *Chandler* 1096; Eureka, *Blasdale*.

Refs.—RUBUS SPECTABILIS Pursh, Fl. 348, t. 16 (1814), type loc. "banks of the Columbia," *Lewis;* Jepson, Man. 481 (1925). *Parmena spectabilis* Greene, Lflts. 1:244 (1906). *Rubus stenopetalus* Cham.; Choris, Voy. Pitt. Kamtch. 2:10 (1822), type loc. Unalaska, Aleutian Isls., *Chamisso*. Var. MENZIESII Wats. Bot. Cal. 1:172 (1876), "near San Francisco and northward; Punta de los Reyes," *Bigelow;* Jepson, Fl. W. Mid. Cal. 280 (1901), ed. 2, 207 (1911), Man. l.c.; not R. menziesii Hook. (1830). *R. ursinus* Torr. Pac. R. Rep. 4:85 (1857); not R. ursinus C. & S. (1827). *Parmena menziesii* Greene, Lflts. 1:244 (1906). *Rubus franciscanus* Rydb. N. Am. Fl. 22:441 (1913).

3. **R. leucodermis** Dougl. WESTERN RASPBERRY. Stems in the first year vigorous and erect ("canes"), bearing 5 to 7-foliolate leaves, in the second year bearing short leafy flowering branchlets with 3-foliolate leaves and bending over and becoming straggling; stems and petioles armed with prickles; herbage glacous; leaves partly persistent through winter, the leaflets round-ovate to ovate-lanceolate,

often unequal-sided at base, doubly serrate, ¾ to 3½ inches long, pubescent but green above, white with a dense close tomentum below; stipules setaceous; flowers few, corymbose, white, 6 to 8 lines broad; calyx-lobes lanceolate or oblong-lanceolate, long-acuminate, exceeding the petals; berry glaucous, 6 lines broad, of an agreeable flavor, either black or red.

Cañon bottoms or hillslopes: Cuyamaca and San Gabriel mountains, 3000 to 7000 feet: Sierra Nevada from Tulare Co. to Shasta Co., 2500 to 7000 feet; Coast Ranges from the Santa Cruz Mts. to Humboldt Co., 300 to 2500 (or rarely 5000) feet. North to British Columbia, east to Wyoming. Apr.-June.

Locs.—S. Cal. mts.: Cuyamaca Lake, San Diego Co., *Munz & Harwood* 7227; Icehouse Cañon, San Antonio Mts., *Parish* 11,938. Sierra Nevada: Chagoopah Falls, Kern Cañon, *Jepson* 1054; Alder Creek, Kaweah basin, *W. Fry* 395; Wolverton Creek, Marble Fork Kaweah River, *Hopping* 401; Yosemite, *Abrams* 4443; Hetch-Hetchy, *Jepson* 3462; Burney Falls, Shasta Co., *Baker & Nutting.* Coast Ranges: Wrights, Santa Cruz Mts., *Elmer* 4994; Guerneville, Sonoma Co., *Davy;* Comptche, Mendocino Co., *H. A. Walker* 214; Cahto School, Mendocino Co., *Jepson* 1851; betw. Kennys and Usal, nw. Mendocino Co., *Jepson* 2154; Weott, Humboldt Co., *Jepson* 16,532; Hubbards sta., s. Humboldt Co., *Davy* 5423; Lasseck Peak, Humboldt Co., *Goddard* 673; Little River, Humboldt Co., *Tracy* 3235; Supply Creek, Hupa Valley, n. Humboldt Co., *Jepson* 2122; Martin ranch, South Fork Trinity River, *Jepson;* Mt. Eddy, *Lemmon;* Sugar Loaf, Sisson, Siskiyou Co., *Jepson* 13,880.

Var. **bernardinus** Jepson comb. n. Pedicels and calyx-tube minutely glandular; prickles either straight or curved, slender or thick-based.—San Bernardino Mts.; San Gabriel Mts. (South Fork Rock Creek, *Peirson* 494) to Mt. Pinos (*Hall*). This represents an intermediate between the species and the next variety.

Var. **glaucifolius** Jepson comb. n. Prickles few, mostly straight and slender; pedicels and calyx with minute gland-tipped hairs.—Pine forests, 3000 to 5000 feet: Sierra Nevada, from Tulare Co. to Butte Co.; North Coast Ranges from Lake Co. to Siskiyou Co. May-July.

Locs.—Sierra Nevada: Cedar Creek, Tulare Co., *Jepson* 612; Placerville (15 mi. above, on Tahoe road), *K. Brandegee;* Chico Mdws., Butte Co., *Heller* 11,618. North Coast Ranges: Elk Mt., n. Lake Co., *Tracy* 2313; Bennet Spr., w. Glenn Co., *Heller* 11,554; Slate Creek, Trinity Co., *H. S. Yates* 454; Humbug Mt., w. Siskiyou Co., *Butler* 1042.

Var. **trinitatis** Berger. Leaves of the flowering branches simple, their blades round-cordate, crenate, shallowly 3-lobed; flowers 3 to 5 lines broad.—Trinity Co. June.

Refs.—RUBUS LEUCODERMIS Dougl.; Hook. Fl. Bor. Am. 1:178 (1834), "Northwest Coast of America," *Douglas,* as synonym; Jepson, Fl. W. Mid. Cal. 280 (1901), ed. 2, 207 (1911), Man. 481 (1925). *R. occidentalis* var. Hook. l.c., "Northwest Coast of America," *Douglas. R. occidentalis* var. *leucodermis* Focke, Abh. Nat. Ver. Bremen 4:147 (1874). *Melanobatus leucodermis* Greene, Lflts. 1:243 (1906). Var. BERNARDINUS Jepson. *Melanobatus bernardinus* Greene, l.c. 244, type loc. Mill Creek Falls, San Bernardino Mts., *Parish* 5046. *Rubus bernardinus* Rydb. N. Am. Fl. 22:444 (1913). Var. GLAUCIFOLIUS Jepson. *R. glaucifolius* Kell. Proc. Cal. Acad. 1:67 (1855), type loc. Placerville, *E. W. Garvitt. Melanobatus glaucifolius* Greene, l.c. 244. Var. TRINITATIS Berger, Rep. N. Y. State Agr. Exp. Sta. part 2, 44 (1925), type loc. Douglas City, Trinity Co., *Blasdale.*

4. **R. vitifolius** C. & S. CALIFORNIA BLACKBERRY. Evergreen bush; stems 2 to 5 feet high and more or less erect, or several to 18 feet long and trailing over the ground or climbing over other shrubs; prickles very slender and straight, or more commonly rather short, recurved and thickened at base; leaves pubescent or almost glabrous, pinnately 3 to 5-foliolate, the leaflets ovate, doubly serrate, ¾ to 3¼ inches long, or sometimes a few (rarely many) upper leaves simple and ovate or palmately lobed; flowers usually dioecious, rarely perfect, ¾ to 1¼ inches wide; petals 5 to 9 lines long; berry black, oblong to ovoid, sweet, 4½ to 7 lines long

Valleys and hills, chiefly along streams, in springy flats or on moist slopes, very common between 5 and 1000 feet, but also occurring up to 3000 feet: cismontane Southern California; Coast Ranges; Great Valley; Sierra Nevada foothills from Mariposa Co. to Shasta Co. North to Oregon. Apr.-May.

Geog. note.—Rubus vitifolius is common in the lowlands of the delta region of the Sacramento and San Joaquin rivers, and thence follows the moist banks or creek bottoms into the foothills. Throughout the Redwood belt it is found in thickets on the borders of groves or of clumps. On the coastal hills facing the sea it often forms very dense tangles in association with Rhus diversiloba, Diplacus aurantiacus, Corylus rostrata, Heracleum lanatum and Artemisia heterophylla. Back of the coast on protected north slopes the California Blackberry is nearly always an element in the soft chaparral. In the Oakland Hills, and elsewhere, where Baccharis pilularis DC. is a pioneer in invasion of grass land on favorable slopes, there follow in Rubus vitifolius, Pteris aquilina, Rhus diversiloba and Rhamnus californica. Dry areas of the state give it no suitable habitat. In the Sierra Nevada foothills from Mariposa Co. south to Kern Co. it is either infrequent or absent, though on north slopes in the half-open lower pine forest of the northern Sierra Nevada it is very common in such places as the Feather River woods.

Tax. note.—It is important that complete material of Rubus vitifolius, illustrating fully the life history, be collected in all parts of the state, in order to form a basis for a more critical treatment than has hitherto been possible. Such important structures as young canes or sterile branches are usually lacking in herbarium specimens, and no satisfactory criteria for analysis or segregation of this species by use of the flowering shoots alone has yet been discovered. The characters of the leaves and prickles, which are usually utilized in the genus, vary so much even in the same individual as to be essentially useless for diagnostic purposes.

Locs.—S. Cal.: Palomar Mt., San Diego Co., *T. Brandegee;* San Bernardino, *Parish;* Pacoima Cañon, San Gabriel Mts., *Peirson* 380; San Gabriel Cañon, San Gabriel Mts., *C. E. Hutchinson;* Las Flores Cañon, Santa Monica Mts., *Barber* 66; lower Sespe Creek, Ventura Co., *Epling & Ellison.* Coast Ranges: San Luis Obispo, *Condit;* Jolon, Monterey Co., *Jepson;* Mill Creek, Santa Lucia Mts., *Jepson;* Del Monte, Monterey Co., *Heller* 6682; Tunitas Creek, San Mateo Co., *Jepson;* Saratoga Creek, Santa Cruz Mts., *Jepson;* San Antonio Creek, Alameda Co., *Kellogg;* Crystal Springs Lake, San Mateo Co., *Elmer* 4664; Berkeley Hills, *Jepson;* Walnut Creek, Contra Costa Co., *Brewer* 1813; Mitchell Cañon, Mt. Diablo, *Jepson;* Hubbards sta., s. Humboldt Co., *Davy* 5401; Weott, Humboldt Co., *Jepson* 16,528; Hupa, n. Humboldt Co., *Jepson* 1965; Delta, Shasta Co., *Jepson* 6176; Sisson, Siskiyou Co., *Jepson* 13,881; Shasta River near Yreka, *Butler* 287. Sacramento Valley: Grand Isl., lower Sacramento River; Hardings Ldg., lower Feather River, *Jepson* 13,882. Sierra Nevada: Mariposa Co. foothills (Zoe 3:28); Italian Bar, Tuolumne Co., *A. L. Grant* 11; North Fork American River near Auburn, *Bolander* 4532; Rich Pt., Feather River, *Jepson;* Lamoine, Shasta Co., *Blankinship.*

Refs.—RUBUS VITIFOLIUS C. & S. Linnaea 2:10 (1827), type loc. San Francisco, *Chamisso;* Jepson, Fl. W. Mid. Cal. 280 (1901), ed. 2, 207 (1911), Man. 482, fig. 477 (1925). *R. ursinus* C. & S. l.c. 11, type loc. San Francisco, *Chamisso. R. ursinus* var. *glabratus* Presl. Epim. Bot. 197 (1851), type loc. Monterey, *Haenke. R. eastwoodianus* Rydb. N. Am. Fl. 22:460 (1913), type loc. Mt. Tamalpais, Marin Co., *Rydberg* 6238.

RUBUS LACINIATUS Willd. Enum. Hort. Berol. 550 (1809). Cut-leaf Blackberry. Plants 4 to 8 feet high; leaves palmately compound with mostly 5 divisions, orbicular in outline, 4 to 8 inches long, the rachises ¼ to 1¾ inches long, each bearing 3 or 5 leaflets or the basal rachises sometimes bearing simple but deeply pinnatifid leaflets; leaflets laciniately toothed and cleft, 1 to 2½ inches long; flowers white or pale pink, in panicles; berry black.—European garden plant, commonly cultivated in California and occasionally escaped: Strawberry, Tuolumne Co., *A. L. Grant* 182; Ione; Sonoma Co.; betw. Shelter Cove and Ettersburg, *L. T. Dempster* 1039a; Garberville, Humboldt Co., acc. *Peirson;* Castella, Shasta Co., *Condit.*

RUBUS RECURVANS Blanch. Rhod. 6:224 (1904). Yankee Blackberry. Stems glabrous, 3 to 7 feet long, at first erect, later recurved and often rooting at tips; prickles rather straight, rather slender, somewhat retrorse; leaves 4 to 7 inches long, with 5 palmately disposed leaflets, 4 of these sessile or on petiolules 1 to 4 lines long, the fifth or terminal one borne on a rachis ½ to 1 inch long and either simple (often 3-lobed) or replaced by 3 leaflets; leaflets broadly ovate, abruptly acute or acuminate, coarsely serrate, or irregularly and partially doubly serrate, puberulent, 1¼ to 2¾ inches long; fruit elongate, ½ to ¾ inch long.—Native of northeastern North America, escaped from cultivation and naturalized in logged-off redwood land at Scotia, Humboldt Co. (*Tracy* 7828).

5. **R. pedatus** Sm. ALASKA BERRY. Stems slender, trailing, rooting at the nodes, 1 to 2 feet long; herbage (especially the petioles) lightly villous; leaves with 3 leaflets, each of the lateral leaflets divided into 2 nearly separate leaflets; leaflets ovate, broadly cuneate at base, irregularly serrate, 5 to 9 lines long; peduncles erect, ¾ to 2¼ inches long, 1-flowered; flowers 5 lines wide; petals ovate, white, 2½ to 3 lines long; berry red, consisting of 2 to 5 drupelets, somewhat persistent on the receptacle; peduncles recurved in age.

Woods in the mountains, 5000 to 6000 feet: Humboldt Co. North to Alaska. June-July.

Locs.—South Fork Mt., Humboldt Co., acc. *Tracy;* Trinity Summit, acc. *Tracy.*

Ref.—RUBUS PEDATUS Sm. Ic. Pl. 3:pl. 63 (1791), type loc. western North America, *Menzies.*

9. **FRAGARIA** L. Strawberry

Perennial herbs, the leaves and flowers in a basal tuft, giving off prostrate stems or runners. Leaves 3-foliolate, with membranous stipules and cuneate-obovate serrate leaflets. Flowers white, borne in cymes on a naked scape. Calyx persistent, bearing 5 bractlets alternate with the calyx-lobes. Petals obovate, short-clawed. Stamens about 20. Pistils numerous, distinct, borne on an elevated convex receptacle; styles lateral. Fruit berry-like, formed of the enlarged succulent receptacle which bears the minute seed-like achenes.—Species 8, north temperate zone, also Mexico and Chile. (Name in reference to the fragrance of the berry.)

Leaves very thick and leathery, with evident reticulate veinlets; flowers very large, ¾ to 1½ inches broad; sea-shore........1. *F. chiloensis.*
Leaves rather thin, occasionally rather thick, but never with evident reticulate veining; flowers smaller, ½ to 1 inch broad.
  Achenes in deep pits in the receptacle; at least the terminal leaflet usually short-petiolulate; inflorescence subumbellate, rather compact and usually shorter than the leaves; Sierra Nevada and n. Cal., above 4000 feet........2. *F. virginiana.*
  Achenes superficial or in shallow pits; leaflets subsessile; inflorescence usually irregularly branched and becoming elongate; throughout the state, 100 to 6600 feet........3. *F. californica.*

1. **F. chiloensis** Duch. Sand Strawberry. Scapes several-flowered, 1 to 4 (or 8) inches high; upper surface of leaves dark green, glabrous, the herbage otherwise densely hairy; leaflets ½ to 1 inch long; calyx-lobes entire; petals roundish; receptacle with the achenes embedded in its surface; fruit 7 to 10 lines in diameter.

Sand-dunes, fertile bluffs and rocky beaches along the coast: San Luis Obispo Co. to Del Norte Co. North to Alaska; Chile. Mar.-May.

Locs.—Oso Flaco, San Luis Obispo Co., *Summers;* Santa Cruz, *Berg;* Pacific Grove, *Tidestrom;* San Pedro, San Mateo Co., *Elmer* 4799; Mt. Davidson, San Francisco, *Jepson* 8206; Bodega Bay, *Chandler* 692; Ft. Ross, *Davy* 1677; Humboldt Bay, *Tracy* 2025; Crescent City, *Shockley.*

Refs.—Fragaria chiloensis Duch. Hist. Nat. Frais. 165 (1766), type loc. Concepcion, Chile; Jepson, Fl. W. Mid. Cal. 281 (1901), ed. 2, 208 (1911), Man. 482, fig. 478 (1925). *F. vesca* var. *chiloensis* L. Sp. Pl. 495 (1753). *F. sericea* Dougl.; Hook. Fl. Bor. Am. 1:185 (1834), as synonym. *F. chilensis* var. *b* Hook. l.c., type loc. Fort Vancouver, Wash., *Scouler* (the luxuriant form with scapes exceeding the leaves). *F. chilensis* var. *scouleri* Wats. Bibl. Ind. 282 (1878). *F. chiloensis* var. *scouleri* Rydb. Mem. Dept. Bot. Columbia Univ. 2:170 (1898).

2. **F. virginiana** Duch. var. **platypetala** Hall. Scarlet Strawberry. Scape 2 to 5 inches high, bearing a usually close umbellate flower cluster, much shorter than the leaves; leaflets obovate or oblong, green, glabrous and glaucous above, below pale and sparsely pubescent, 1 to 2 inches long; petioles hairy; flowers 7 to 12 lines broad; fruit 5 to 7 lines broad; achenes set in deep pits.

Meadow or stream borders and open woods, 4000 to 8000 feet: Sierra Nevada from Tulare Co. to Modoc Co.; thence west to Siskiyou Co. North to British Columbia. May-July.

Geog. note.—Var. platypetala Hall, the Sierra Nevada form of the eastern F. virginiana Duch., differs from the Rocky Mts. form (var. glaucus Wats.) only in the spreading hairs of the petioles. The following stations validate the range for California.—Sierra Nevada: Funston Lower Mdw., Kern Cañon, *Hopping* 149; Pine Ridge, Fresno Co., *Hall & Chandler* 223; Huckleberry Creek, Huntington Lake, *Jepson* 13,072; Lake Merced, Merced River, *Jepson* 3192; Truckee, *Sonne;* Big Mdws., Plumas Co., *R. M. Austin;* Mineral, Tehama Co., *J. Grinnell;* Forestdale, sw. Modoc Co., *M. S. Baker;* Willow Creek, Modoc Co., *R. M. Austin.* Siskiyou Co.: Goosenest foothills, *Butler* 1315; Sisson, *Jepson* 13,876; Marble Mt., *Chandler* 1569. Hog Ranch, Tuolumne Co., *Hall & Chandler* 3347, is typical F. virginiana Duch. and doubtless introduced.

Var. **sibbaldifolia** Jepson. Leaflets small (5 to 10 lines long), the apices subtruncate, 3 to 7-toothed.—High montane, 8000 to 10,000 feet: Sierra Nevada from Olancha Peak to Mt. Dana.

Locs.—Olancha Peak, Tulare Co., *Hall & Babcock* 5282; Volcano Creek, Tulare Co., *Hall & Babcock* 5321; Fish Creek, se. Tulare Co., *Hall & Babcock* 5210; West Vidette, Bubbs Creek, Fresno Co., *Jepson* 829; Mt. Dana, *Chesnut & Drew.*

Refs.—FRAGARIA VIRGINIANA Duch. Hist. Nat. Frais. 204 (1766), type from Virginia. Var. PLATYPETALA Hall, Univ. Cal. Publ. Bot. 4:198 (1912); Jepson, Man. 482 (1925). *F. platypetala* Rydb. Mem. Dept. Bot. Columbia Univ. 2:177 (1898), type loc. Spout, B. C., *Macoun*. *F. truncata* Rydb. l.c., type loc. Nevada Co., *Michener & Bioletti* (pubescence more sparse, scape with fewer flowers, sepals and bractlets broader, petals narrow, ex char.). Var. SIBBALDIFOLIA Jepson, l.c. 483. *F. sibbaldifolia* Rydb. l.c. 176, type loc. Mt. Whitney, Tulare Co., *Coville & Funston* 1712. *F. vesca* Cov. Contrib. U. S. Nat. Herb. 4:95 (1893); not F. vesca L. (1753). *F. virginiana* var. *platypetala* f. *sibbaldifolia* Hall, l.c. 199.

3. **F. californica** C. & S. WOOD STRAWBERRY. Scapes 4 to 5 (rarely 10) inches high, cymosely 2-flowered; scapes and petioles pilose, the hairs ascending or spreading; leaflets thin, light green, 1 to 1¾ inches long; flowers 5 to 11 lines broad; fruit globose, about 4 to 5 lines broad, the achenes borne superficially.

Openly wooded hills or vales: Southern California mountains, 4500 to 6600 feet; Sierra Nevada from Tulare Co. to Butte Co., 3500 to 6000 feet; Coast Ranges from Santa Cruz Co. to Siskiyou Co., mostly 50 to 2000 feet. North to Washington.

Locs.—The hairy pubescence is a little variable in amount and more variable in position on the stems and petioles. The hairs may be ascending (Ross Valley, Marin Co., *Jepson* 13,873), partly ascending and partly spreading (Cahto, Mendocino Co., *Jepson* 1854), spreading (Mariposa Big Trees, *Hall* 8992, = var. crinita Hall), or deflexed-spreading (Sisson, Siskiyou Co., *Jepson* 13,874). As validating the range we cite as follows. S. Cal. mts.: Julian, e. San Diego Co., *T. Brandegee;* Santa Rosa Mts., *Munz* 5855; Strawberry Valley, San Jacinto Mts., *Condit;* San Bernardino Mts., *Parish;* Las Cruces, Santa Inez Mts., acc. *Peirson*. Sierra Nevada: Redwood Mdws., Mineral King, Tulare Co., *Hall & Babcock* 5375; Hodgdon ranch, Mariposa Co., *Jepson* 10,531; Hogan Mt., Mariposa Co., *Congdon;* Calaveras Big Trees, *A. L. Grant;* Brush Creek, Butte Co., *Conger*. Coast Ranges: Santa Lucia Mts., *Barber;* Carmel Bay, *Elmer* 4897; Aptos, Santa Cruz Co., *C. F. Baker* 1859; Mt. Madonna, Santa Cruz Mts., *Jepson* 9683; Lexington, Santa Clara Co., *Heller* 7296; Lake San Andreas, San Mateo Co., *Jepson* 9545; Mt. Diablo, Contra Costa Co., *Brewer* 1145; Mt. Davidson, San Francisco, *Jepson* 10,348; near Calistoga on Knights Valley grade, *Jepson* 13,872; Cahto, Mendocino Co., *Jepson* 1854; Buck Mt., Humboldt Co., *Tracy* 4340; Berry's ranch, Redwood Creek, n. Humboldt Co., *Jepson* 1973; betw. Sisson and Upton, Siskiyou Co., *Jepson* 13,874; Marble Mt., Siskiyou Co., *Chandler* 1558; Crescent City. Fl. Apr.-June.

Var. franciscana Rydb. Leaves thicker and more strongly veined.—Exposed habitats about San Francisco Bay: Kings Mt., San Mateo Co., *C. F. Baker* 233; Berkeley Hills, Alameda Co., *Chandler;* Mt. Tamalpais, *Brandegee;* Calistoga (sw. of), *Jepson* 4021.

Refs.—FRAGARIA CALIFORNICA C. & S. Linnaea 2:20 (1827), type from Cal., *Chamisso;* Jepson, Fl. W. Mid. Cal. 280 (1901), ed. 2, 207 (1911), Man. 483 (1925). *F. vesca* var. *g* Nutt.; T. & G. Fl. 1:448 (1840), type loc. from Oregon, *Nuttall*. *F. crinita* Rydb. Mem. Dept. Bot. Columbia Univ. 2:171 (1898), type from Wash., Wilkes Exped. (flowers large, stems and petioles densely pilose). *F. californica* var. *crinita* Hall, Univ. Cal. Publ. Bot. 4:198 (1912). Var. FRANCISCANA Rydb. l.c. 173, type loc. Marin Co., *Eastwood;* Jepson, Man. l.c.

10. POTENTILLA L.[1] FIVE FINGER

Perennial herbs (rarely annuals or shrubs). Leaves compound, typically with serrate or cleft leaflets. Flowers white, yellow (or purple in one), in terminal cymes, rarely solitary, the cymes sometimes capitate. Calyx-tube (hypanthium) saucer-shaped, campanulate or cup-shaped, bearing 5 calyx-lobes and 5 alternate bractlets. Petals orbicular to linear. Stamens 10 (rarely 5) to many, the filaments filiform or dilated. Pistils few to numerous, borne upon an elevated receptacle, becoming in fruit small turgid crustaceous achenes; styles sub-basal, lateral or nearly terminal, deciduous.—Species 360, North America, Europe and Asia, markedly arctic, a few in New Zealand, northern Africa and the Andes of South America. (Diminutive of the Latin potens, powerful, some species medicinal.)

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[1] Ethel K. Crum, a scholarly assistant employed (1930–1933) on this and related groups, became ardently attached to Potentilla, wherefore certain new varieties bearing her name.

A. Ovules ascending; styles sub-basal; filaments filiform; achenes hairy or glabrous; perennials.

Stamens about 20 to 25; leaves pinnate.
  Low shrub; petals yellow; styles obconic, short; achenes hairy.—Subgenus DASIPHORA.......... 1. *P. fruticosa.*
  Perennial herbs; achenes glabrous.
    Petals dark purple; stems ascending, rooting below; styles filiform, subequal to mature achenes.—Subgenus COMARUM..........2. *P. palustris.*
    Petals yellow; stems wholly creeping, rooting at joints; leaves white-silky beneath; styles short.—Subgenus ARGENTINA..........3. *P. anserina.*
Stamens 5; petals yellow, minute; leaves 3-foliolate; styles obconic, short; achenes 10 to 15.—Subgenus SIBBALDIA..........4. *P. sibbaldii.*

B. Ovules pendulous; styles subterminal (except in P. glandulosa); achenes glabrous; herbs.

I. STAMENS 15 TO 25 (10 IN NOS. 7, 8, AND 10), INSERTED ON A DISK OR ANNULAR THICKENING NEAR THE RECEPTACLE; FILAMENTS FILIFORM; PETALS YELLOW (SOMETIMES WHITISH OR CREAM-COLOR); CALYX-TUBE SAUCER-SHAPED; ACHENES (USUALLY) MANY; PERENNIAL OR ANNUAL HERBS.—Subgenus EUPOTENTILLA.

1. *Leaves ternate or pinnate; leaflets usually 3 to 5 (7 to 11), merely toothed, not dissected; inflorescence more or less leafy; herbage often glandular; petals yellow (rarely whitish or cream-color).*

Styles sub-basal, spindle-shaped, not longer than the mature achenes (except in var. cuneifolia); herbage more or less glandular-pubescent; perennial..........5. *P. glandulosa.*
Styles subterminal, conoid to filiform-subulate.
  Stamens 25 to 30; styles filiform-subulate, about equaling mature achenes; perennial.......... 6. *P. saxosa.*
  Stamens 10 to 20; styles very short-conoid; achenes numerous; inflorescence leafy, branching, often more or less sympodial; annuals or biennials.
    Leaflets 5; stems erect or ascending; cyme spreading; annual; stamens 10....7. *P. rivalis.*
    Leaflets 3; cyme often falsely racemose.
      Stems prostrate to erect; leaflets cuneate-obovate, incised-serrate; stamens 10; annual..........8. *P. leucocarpa.*
      Stems erect; leaflets broadly to narrowly obovate, coarsely crenate or dentate; annuals or biennials.
        Stamens 15 to 20; achenes tan or brownish, rugulose; leaves obovate or obovate-oblong, incised-dentate; flowers 5 to 6 lines broad..9. *P. monspeliensis.*
        Stamens about 10; achenes whitish, smooth; leaves broadly obovate, coarsely crenate; flowers 3 lines broad..........10. *P. biennis.*

2. *Leaves pinnate or palmate; leaflets (3 or) 5 to many, toothed or (usually) deeply incised or cleft into lanceolate or linear-oblong lobes; inflorescence bracteate; petals yellow; perennial herbs, the stems from a simple or branched short root-crown.*

a. Styles thickish, not longer than mature achenes; leaflets deeply pinnately incised; herbage tomentose, not glandular; White Mts.

Leaves pinnate; leaflets (5 or) 9 to 11, oblong in outline, greenish above, tomentose below, the segments with revolute margins..........11. *P. pennsylvanica.*
Leaves mostly palmate; leaflets usually 5, obovate in outline, often silvery-silky on both sides; segments without revolute margins..........12. *P. pseudosericea.*

b. Styles slender, much exceeding mature achene.

Leaves pinnate.

Leaflets 11 to 27, deeply incised above the middle; stems leafy; Los Angeles coast.................... 13. *P. multijuga.*

Leaflets 7 to 13; stem leaves few, reduced.

Leaflets pinnately toothed or incised; herbage not tomentose; Sierra Nevada and North Coast Ranges....................14. *P. drummondii.*

Leaflets palmately toothed or incised.

Herbage greenish, not tomentose.

Petioles as long as the blades to ⅓ as long; leaflets incised ½ to ¾ of the way to the midrib; coast line....................15. *P. hickmanii.*

Petioles very short, 1/10 to ⅕ as long as the blades; leaflets incised nearly to the midrib into linear segments; Sierra Nevada....................16. *P. millefolia.*

Herbage more or less tomentose, often silvery; Sierra Nevada and Siskiyou Co......... 17. *P. breweri.*

Leaves palmate or subpalmate.

Herbage greenish, silky-villous to glabrate, not tomentose.

Leaflets 3, flabelliform, incisely many-toothed; cymes few-flowered; Sierra Nevada and Siskiyou Co....................18. *P. flabellifolia.*

Leaflets 3 to 7 (or 9), cuneate or cuneate-obovate; cymes many-flowered.

Leaves usually strictly palmate, the leaflets 3 to 5, crenately 3 to 5-toothed at the summit only; ranges bordering the southern deserts....................19. *P. wheeleri.*

Leaves usually subpalmate, the leaflets 5 to 7 (or 9), toothed at the apex or above the base, the teeth lanceolate or triangular; Sierra Nevada.................... 20. *P. diversifolia.*

Herbage often tomentose; leaves strictly palmate; leaflets oblanceolate to obovate, pinnately toothed or incised.

Leaflets tomentose, silky, villous or glabrate beneath, toothed to deeply incised, the margins not revolute; montane, widely spread....................21. *P. gracilis.*

Leaflets more or less tomentose beneath, divided almost to the midrib into spreading linear segments with revolute margins (except in var. inyoensis); Modoc Co..... 22. *P. flabelliformis.*

II. STAMENS 5 TO 20, INSERTED ON THE MARGINS OF OR WELL UP ON THE CALYX-TUBE; NO ANNULAR DISK; LEAVES ALWAYS PINNATE; PERENNIAL HERBS.

1. *Filaments filiform (except P. purpurascens and P. argyrocoma); stamens 5 to 20; calyx-tube mostly campanulate or bowl-shaped; petals white or yellow; pistils 1 to 15 (or 20 to 25); leaflets many to numerous, usually crowded or imbricated, 1 to 3 (or 4) lines long, commonly palmately cleft or divided into 2 to 4 (or 5) segments.*—Subgenus IVESIA.

Stamens 15 to 20.

Leaves not terete but with more or less imbricated leaflets; Sierra Nevada.

Petals not long-clawed.

Filaments dilated; pistils 20 to 25; herbage pubescent to glabrous, somewhat glandular....................23. *P. purpurascens.*

Filaments filiform; pistils 2 to 8; herbage glabrous or nearly so, glaucous, not glandular....................24. *P. kingii.*

Petals long-clawed.

Pistils 9 to 12; herbage villous but greenish; petals yellow; stem leaves few, reduced....................25. *P. campestris.*

Pistils 2 to 5; stems leafy.

Herbage greenish, silky-villous; petals white....................26. *P. unguiculata.*

Herbage densely white-silky; petals yellow or white....................27. *P. pickeringii.*

Leaves terete, the leaflets closely imbricated; herbage silvery-silky.

Filaments dilated; pistils 4 to 7; cymes more or less corymbosely clustered; San Bernardino Mts....................28. *P. argyrocoma.*

Filaments filiform; pistil 1; cymes open-paniculate, much branched; Sierra Nevada, Southern California....................29 *P. santolinoides.*

Stamens 5 or 10 (20 in P. callida).

Herbage silvery-silky; leaves terete; stamens 5; cymes capitate; Sierra Nevada..30. *P. muirii.*

Herbage villous but greenish, often more or less glandular; leaves not terete (except sometimes in no. 33).

Cymes open, few-flowered.

Stamens 20; Mt. San Jacinto....................31. *P. callida.*

Stamens 5; Sierra Nevada....................32. *P. shockleyi.*

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Cymes more or less corymbosely congested or the clusters subcapitate or capitate; Sierra Nevada; Siskiyou and Trinity Cos.
Stems not wiry; petioles not over ⅓ as long as rachis; leaves sometimes terete; stamens 5 or 10........33. *P. gordonii.*
Stems wiry; petioles ½ as long as rachis; leaves not terete; stamens 5........34. *P. webberi.*

2. *Filaments dilated, at least the alternate (except in P. congesta); stamens 10, alternately long and short; calyx-tube mostly cupulate or campanulate; petals white, rarely pinkish or yellowish; leaflets 5 to numerous, ½ to 1¾ inches long, often only 2 to 6 lines long.*—Subgenus Horkelia.

a. Bractlets ovate to narrowly lanceolate.

Filaments opposite the sepals broadly dilated, those opposite the petals usually nearly linear.
Calyx-tube 3 to 5½ lines wide; leaflets doubly toothed or somewhat incised; cymes leafy; plants stout; mainly coast line........35. *P. californica.*
Calyx-tube 1 to 2½ lines wide; leaflets deeply incised; plants slender; montane....36. *P. elata.*
Filaments all broadly dilated, those opposite the petals usually shorter and narrower (in P. congesta usually all linear-lanceolate).
Pedicels erect, slender to stoutish.
Lower stipules entire, or sometimes 2 or 3-cleft, not forming a conspicuous basal tuft.
Leaflets toothed or somewhat incised; coastal except no. 40.
Herbage sparsely villous and more or less glandular.
Leaflets 5 to 9, suborbicular, truncate and more or less palmately toothed at apex; San Diego Co........37. *P. truncata.*
Leaflets 13 to 25, ovate, toothed above the base, or cuneate, usually rounded at apex; coastal, San Mateo Co. to San Diego Co.....38. *P. lindleyi.*
Herbage usually densely pubescent, often silky, sometimes glandular.
Pubescence rather coarse, subsilky, appressed or subappressed on leaflets, sometimes coarser and spreading on stems and petioles; cymes dichotomously branched, the clusters congested-corymbose to subcapitate; coastline........39. *P. kelloggii.*
Pubescence fine, silky-tomentulose; cymes not dichotomously branched, often rather open; Lake Co. and mts. of S. Cal.....40. *P. bolanderi.*
Leaflets incised ½ way or more toward the midrib, or deeply dissected, the segments oblong to linear.
Herbage silky-villous; cymes more or less congested; pistils mostly 12 to 25; Coast Ranges........41. *P. stenoloba.*
Herbage white-hispid; cymes open; pistils 12 to 18; White Mts........42. *P. hispidula.*
Lower stipules 2 to several-cleft into filiform lobes which usually form a conspicuous basal hair-like tuft; pistils 3 to 12.
Cymes corymbosely congested, many-flowered; petals cream-color or yellowish; Siskiyou region........43. *P. daucifolia.*
Cymes few-flowered, dichotomously and openly branched; petals white or pinkish; Humboldt and Del Norte Cos.
Leaves green; root-crown simple........44. *P. howellii.*
Leaves silvery-villous; root-crown branched........45. *P. sericata.*
Pedicels very slender, recurved; cymes open-paniculate, much branched........46. *P. parryi.*

b. Bractlets linear to filiform, often much reduced.

Leaflets 9 to 17, cuneate-obovate to cuneate-oblong, toothed above the base; herbage glandular and more or less spreading-pubescent; petals cuneate, emarginate; filaments all broadly dilated........47. *P. douglasii.*
Leaflets 5 to 11, cuneate-oblanceolate or cuneate-oblong, 3 to 5-toothed at apex only; herbage silky; filaments usually all linear-subulate (rarely dilated); petals usually linear-acute (rarely broader)........48. *P. congesta.*

I. Subgenus **Dasiphora.** Shrub; leaves pinnate; styles lateral, clavate; achenes hairy.

1. **P. fruticosa** L. Bush Cinquefoil. Much-branched shrub 1 to 4 feet high; branchlets densely leafy, silky-hairy when young, in age with brownish shreddy bark; leaves pinnate, white-pubescent beneath, the blades ½ to ¾ inch long, 4 to 7 lines wide, the leaflets crowded, the petioles 1 to 2 lines long; leaflets 3 to 7, oblong, entire, 2 to 5 lines long, the margin often revolute; flowers ½ to 1 inch wide; petals yellow, orbicular; stamens about 25.

Meadows or rocky places near timberline, 7000 to 12,000 feet: White Mts.; Sierra Nevada from Fresno Co. to Modoc Co., thence west to Siskiyou Co. East to the Rocky Mts. and New Jersey, north to British America; Europe, Asia. July-Aug.

Locs.—White Mts.: McAfee Mdws., *Duran* 2812. Sierra Nevada: Fresno Co., *E. Ferguson* 527; Parker Pass, Madera Co., *A. L. Grant* 1606; Mono Pass, *Jepson* 4430; Mt. Dana, *Jepson* 3322; Soda Springs Cañon above Kennedy Lake, Tuolumne Co., *A. L. Grant* 486; Lily Lake, Eldorado Co., *Ottley* 1166 (with large flowers and plane leaves similar to plants of the n. Rocky Mts. and Alaska); Martin Sprs., Eagle Lake, *Brown & Wieslander* 4; Benton Mdws., Warner Mts., *L. S. Smith* 890; Mt. Eddy, Siskiyou Co., *Alexander & Kellogg* 330.

Refs.—POTENTILLA FRUTICOSA L. Sp. Pl. 495 (1753), type from Europe; Jepson, Man. 486, fig. 480 (1925). *Dasiphora fruticosa* Rydb. Mem. Dept. Bot. Columbia Univ. 2:188, pl. 101, figs. 1–6 (1898). *P. tenuifolia* Willd.; Schlecht. Ges. Nat. Freunde Berlin Mag. 7:284 (1815). *P. fruticosa* var. *tenuifolia* Lehm. Monog. Pot. 31 (1820). *Dasiphora fruticosa tenuifolia* Rydb. l.c. 190. *P. fruticosa* var. *parvifolia* Wats. Proc. Am. Acad. 8:561 (1873), type loc. East Humboldt Mts., Nev.; not P. parvifolia Fisch. (1831). *P. fruticosa* var. *alpina* Wats.; Wats. & Rothr. Cat. Pl. Wheeler Surv. 8 (1874), type from Utah, *Rothrock. Dasiphora fruticosa monticola* Rydb. l.c. 190, pl. 101, fig. 7 (1898).

II. SUBGENUS **Comarum.** Leaves pinnate; petals purple; styles lateral; achenes numerous, hairy.

2. **P. palustris** Scop. MARSH COWBERRY. Stems stout, ascending from long creeping rootstocks, 2 to 3 feet high, often rooting at the decumbent base, glabrous below, puberulent above; leaves pinnate; leaflets 5 to 7, oblong, 1 to 1¾ inches long, mostly glabrous except along the veins and margins; petioles 1 to 3 inches long; lower stipules adnate, 1 to 1½ inches long; flowers 1 to 2 inches wide, few to several in an open cyme; calyx spreading, pubescent, purplish-green below, dark reddish-purple above; sepals ¼ to ½ inch long, or becoming 1 inch long; petals very dark purple, ovate-lanceolate, 2 lines long; stamens 20 to 23, on a glandular ring; filaments rather stout, broader at base, dark purple; receptacle becoming enlarged and spongy in fruit; achenes numerous.

Cold bogs, often aquatic, 2000 to 6000 feet: Placer Co. to Shasta and Modoc Cos. North to Alaska, east to Labrador; Europe, Asia. June-Aug.

Locs.—Lake Tahoe (Univ. Cal. Publ. Bot. 9:239); Goose Valley, Shasta Co., *M. S. Baker;* Willow Lake, Modoc Co., *R. M. Austin* 544.

Var. **villosa** Lehm. Stems often glandular on upper portion; leaves densely appressed with short silky hairs beneath.—Mendocino Co. (Garcia Creek, acc. *J. T. Howell*) to Del Norte Co. (Crescent City, *Davy* 5933). North to Canada, east to the Atlantic. Europe, Asia.

Refs.—POTENTILLA PALUSTRIS Scop. Fl. Carn. ed. 2, 1:359 (1772); Jepson, Man. 485 (1925). *Comarum palustre* L. Sp. Pl. 502 (1753), type from Europe; Rydb. Mem. Dept. Bot. Columbia Univ. 2:162, pl. 99 (1898). *Argentina rubra* Lam. Fl. Fr. 3:120 (1778). Var. VILLOSA Lehm. Monog. Pot. 53 (1820), type loc. (acc. Rev. Pot. 74,—1856), "Groenlandia et Hibernia"; Jepson, Man. 486 (1925).

III. SUBGENUS **Argentina.** Leaves interruptedly pinnate; petals yellow; styles lateral; achenes numerous, glabrous.

3. **P. anserina** L. SILVER-WEED. Leaves and peduncles in a basal tuft on a fascicle of roots, producing slender runners, these rooting at each joint; leaves pinnate, white-silky beneath, dark green and usually pubescent above, the blades 3½ to 12 (or 24) inches long; petioles ½ to 6 (or 12) inches long; leaflets 13 to 21, with smaller ones interposed, oblong, sharply serrate, ½ to 1½ inches long; flowers solitary on long peduncles, ¾ to 1¼ inches wide; calyx-tube turbinate, 2 to 2½ lines wide; petals elliptic to orbicular, much exceeding the sepals; stamens 20 to 25; receptacle hairy; achenes corky, with a deep dorsal groove.

Marshy or springy places, 5 to 6000 feet: cismontane Southern California. East to the Atlantic. Europe, Asia. Apr.-July. It has been called Goose-grass immemorially by the folk.

Locs.—Ballona, *Braunton* 455; Santa Monica, *Barber* 131; Mt. San Bernardino, *Hall* 1034.

Var. **sericea** Hayne. Leaves silky and usually silvery on both surfaces.—Mountain meadows and saline flats of the arid interior: San Bernardino Mts.; east side of the Sierra Nevada from Mono Co. to Siskiyou Co. North to British America, east to the Atlantic. Europe, Asia.

Locs.—Bear Valley, San Bernardino Mts., *Parish;* Summit Lake, Mono Co., *Maule;* Butte Valley, Siskiyou Co., *Butler* 1874.

Var. **grandis** T. & G. Stolons, peduncles and petioles glabrous to glabrate; leaflets glabrous above or nearly so; achenes smooth (non-corky) or somewhat corky, "ungrooved dorsally" or often with a shallow groove.—Mostly near the coast, 5 to 100 feet: Ventura Co. to Del Norte Co. North to Alaska. Apr.-Sept.

Tax. note.—The Pacific Coast plants, for long referred to Potentilla anserina, have been segregated by Howell (Fl. Nw. Am. 179) under the name P. pacifica Howell, a segregation maintained by Rydberg (N. Am. Fl. 22:353) and by Fernald (Rhod. 11:8) on the basis of the glabrous upper leaf surfaces and the ungrooved achenes. As to pubescence, the leaves above are generally though not always absolutely glabrous. As to achenes, most specimens lack fruits, but in all California material observed the achenes are shallowly channeled dorsally. Immature achenes do not or may not show this extremely slight channel; the outer tissues are soft and the channel is commonly dissembled or lost in dried specimens. Further, individuals segregated as P. pacifica frequently resemble in the sum total of their characters specimens of P. anserina much more than other individuals authentically named P. pacifica. The feature of prostrate leaves in P. anserina and erect leaves in the form P. pacifica (var. grandis T. & G.) is proposed as another differentiating character but field observation shows that in the variety the leaves assume the prostrate habit when growing in drier or more exposed situations. The form of salt marshes named Argentina occidentalis by Rydberg is described as having a spreading habit with the leaves, peduncles and stolons below the limits of variation in the var. grandis, and with broader shorter bractlets. We find that plants in exposed situations are of spreading habit, with the leaves, peduncles and stolons averaging shorter than in the variety grandis, while plants in wet situations or among tall grasses tend to have the leaves erect and the structures mentioned correspondingly longer. These differences in size and habit are not associated with differences in the shape or relative lengths of bractlets and sepals. The bractlets vary from broadly oval or narrowly oblong to lanceolate, and are either about equal to the sepals, or slightly longer or shorter.

Locs.—Oxnard, Ventura Co., *Davy* 7807; Morro, San Luis Obispo Co., *Munz* 9246; Carmel, *Newlon* 112; Moss Beach, San Mateo Co., *Alice King* (achenes corky); Lake Merced, San Francisco, *Jepson* 10,259; Pt. Reyes, *Davy* 6733; Jenner, Sonoma Co., *Crum* 1228 (leaves 30 inches long); Ft. Bragg, *W. C. Mathews;* Samoa, Humboldt Co., *Tracy* 2590.

Refs.—POTENTILLA ANSERINA L. Sp. Pl. 495 (1753), type from Europe; Jepson, Fl. W. Mid. Cal. 281 (1901), ed. 2, 208 (1911), Man. 485 (1925) in part. *Argentina anserina* Rydb. Mem. Dept. Bot. Columbia Univ. 2:159, pl. 98 (1898). Var. SERICEA Hayne, Arzneigew 4:31 (1816). *P. anserina* var. *concolor* Ser.; DC. Prod. 2:582 (1825). *Argentina anserina* var. *concolor* Rydb. Mem. Dept. Bot. Columbia Univ. 2:160 (1898), mainly. *A. argentea* Rydb. Bull. Torr. Club 33:143 (1906). *P. anserina* var. *argentea* Jepson, Man. 485 (1925). Var. GRANDIS T. & G. Fl. 1:444 (1840), type from Ore., *Scouler*. *Argentina anserina* var. *grandis* Rydb. Mem. Dept. Bot. Columbia Univ 2:161 (1898). *P. pacifica* Howell, Fl. Nw. Am. 179 (1898), "salt marshes along the coast, Alaska to California." *Argentina pacifica* Rydb. N. Am. Fl. 22:353 (1908). *P. anserina* Jepson, Fl. W. Mid. Cal. 281 (1901), ed. 2, 208 (1911), Man. 485, fig. 479 (1925), in part. *Argentina occidentalis* Rydb. N. Am. Fl. 22:354 (1908), type loc. Suisun, *C. F. Baker* 3217. *P. occidentalis* Fedde, Just Bot. Jahresb. 36^2:488 (1908).

IV. SUBGENUS **Sibbaldia.** Leaves trifoliolate; stamens 5; style lateral; achenes 10 to 15, glabrous.

4. **P. sibbaldii** Hal. f. ALPINE SIBBALDIA. Low matted plant, the stems from a branched rootstock, 2 to 6 inches high; herbage sparsely silky-strigulose; leaves ternate, on petioles ½ to 2 inches long; leaflets broadly cuneate, 3 to 5-toothed at apex, sparsely soft-hairy, ¼ to ¾ inch long; cymes commonly few-flowered, compact at first, becoming open in fruit; flowers 2 to 2½ lines wide; petals yellow, ovate or elliptic, shorter than the sepals; stamens 5 (or 6); achenes 5 to 20.

Alpine slopes or meadows, 8000 to 12,000 feet: San Bernardino Mts.; White Mts.; Sierra Nevada from Tulare Co. to Siskiyou Co. North to Alaska, east to New England. Europe, Asia. May-Sept.

Locs.—San Bernardino Mts.: Foxesee Creek, Santa Ana River, *Peirson* 2262. White Mts.: McAfee Mdws., *Duran* 2808. Sierra Nevada: Farewell Gap, *Purpus* 5194; Kaweah Peak, *Jepson* 5001; Kearsarge Pass, *Jepson* 864; Evolution basin, Fresno Co., *E. Ferguson* 478; Mt. Lyell, *Jepson* 3325; Castle Peak (Mt. Stanford), Nevada Co., *Sonne;* Mt. Shasta, *Jepson* 14,169; Hornbrook, Siskiyou Co., *Howell* 1383.

Refs.—POTENTILLA SIBBALDII Hal. f.; Ser. Mus. Helv. 1:51 (1818). *Sibbaldia procumbens* L. Sp. Pl. 284 (1753), type from Europe; Rydb. Mem. Dept. Bot. Columbia Univ. 2:185, pl. 100, figs. 1–5 (1898). *P. procumbens* Clairv. Man. 166 (1811); Jepson, Man. 485 (1925); not P. procumbens Sibth. (1794).

V. SUBGENUS **Eupotentilla.** Leaves pinnate or palmate; calyx-tube usually saucer-shaped; petals yellow, rarely whitish or cream-color; stamens (10 or) 15 to 25; filaments filiform; style usually terminal or nearly so; achenes glabrous, usually many.

5. **P. glandulosa** Lindl. STICKY CINQUEFOIL. Stems erect, often reddish, 1 to 4 feet high; herbage pubescent, the stems and petioles glandular; leaves pinnate, the basal 4 to 8 or even 15 inches long; leaflets 5 to 7 (or 9), or those of the uppermost leaves 3, roundish-ovate, or obovate with cuneate base, 1 to 3 inches long; cymes lax, leafy-bracted, few-flowered; flowers 4 to 7 lines wide; calyx-tube saucer-shaped, 2 to 2¼ (or in fruit 3) lines wide; petals pale yellow or sometimes pale cream, obovate, rounded at apex, or orbicular, scarcely equaling the sepals; sepals ovate-oblong to lanceolate, acute or acuminate; stamens 25; pistils many, the styles spindle-shaped.

Half-shaded slopes, 250 to 3000 feet: outer and middle North Coast Ranges from Humboldt Co. to Santa Clara Co.; Sierra Nevada from Shasta Co. to Fresno Co.; cismontane Southern California. East to South Dakota and New Mexico. Apr.-May.

Locs.—Hupa, Humboldt Co., *Manning;* Potter Valley, Mendocino Co., *Nettie Purpus;* Yountville, Napa Valley, *Jepson* 127p; Berkeley Hills, *Jepson* 129p; Los Gatos, *Heller* 7329. Sierra Nevada (less typical than the coastal plants): Redding, Shasta Co., *Heller* 7904; Forest Ranch, Butte Co., *Heller* 11,411; Auburn, *Shockley;* Phoenix Lake, Tuolumne Co., *A. L. Grant* 40; Chowchilla Mts., Fresno Co., *F. P. McLean.* S. Cal. (most plants intermediate toward var. reflexa): San Bernardino foothills, *Parish;* Cootca, Palomar Mt., *Jepson* 1511; Cuyamaca Lake, *Munz* 9755.

Var. **wrangelliana** Wolf. Stems very rank, usually very glandular, much and widely branched, 3 to 4 feet high; basal leaves 6 to 17 inches long; calyx-lobes broadly elliptical or oval, obtuse, mucronate, often rather thin and reticulate; flowers usually 3 to 4 lines wide.—Dry banks or wooded slopes, 100 to 4700 feet: Coast Ranges from Mendocino Co. to Monterey Co.; Sierra Nevada from Placer Co. to Tulare Co.; cismontane Southern California. Apr.-June.

Locs.—Ft. Bragg, *W. C. Mathews* 108; Bennett Sprs., w. Glenn Co., *Heller* 11,543; Ft. Ross, Sonoma Co., *Heller* 6598; Gates Cañon, Vaca Mts., *Jepson* 131p; upper Marsh Creek, Mt. Diablo, *Jepson* 9995; Woodlawn, San Mateo Co., *Crum* 707; Eva sta., Santa Cruz Mts., *Jepson* 125p; Greninger Creek, Gilroy, *Jepson* 9687 (less robust and glandular, intermediate toward the species); Pt. Lobos, Carmel River, *E. Ferguson* 313. Sierra Nevada (plants not typical, varying toward var. reflexa, var. incisa or var. nevadensis; in general less glandular than the coastal form): Deer Park, Placer Co., *Helen Geis* 31; Fallen Leaf Lake, Eldorado Co., *M. S. Baker;* Giant Forest, *K. Brandegee.* S. Cal.: San Miguelito Cañon, Lompoc, *Munz* 10,252; Cañon Diablo, San Bernardino Mts., *Parish* 11,902; Fallbrook, San Diego Co., *Cleveland.*

Var. **reflexa** Greene. Stems slender; leaflets commonly simply serrate; cymes open, usually not leafy, the branches and pedicels more or less elongated; calyx-lobes usually ovate; petals and calyx-lobes usually reflexed in anthesis; petals yellow.—Moist soil, open flats, cañons, pine slopes or along watercourses, usually from 4000 to 9500 feet: Humboldt Co. to Mendocino Co.; Sierra Nevada from Siskiyou Co. to Tulare Co.; Mt. Pinos region to the Laguna Mts., Southern California. May-Aug.

Locs.—Coast Ranges (leaflets tending toward the doubly serrate condition): Nature's Rest, Klamath River, Humboldt Co., *Chandler* 1425; Musser Hill, Trinity Co., *Yates* 355; Round Valley, Mendocino Co., *Goddard* 624. Sierra Nevada: Medicine Lake (mt. w.), e. Siskiyou Co., *M. S. Baker;* Eagle Peak ridge, Warner Mts., e. Modoc Co., *L. S. Smith* 1036; Lassen Peak, *R. M. Austin* 387; Bear Valley, Nevada Co., *Jepson* 114p; Mt. Tallac, *Jepson* 8148; Cow Creek, Tuolumne Co., *A. L. Grant* 70; Lake Merced, Merced River, *Jepson* 3210; Yosemite, *Jepson* 4253; Fresno Flats, Madera Co., *Jepson* 12,842; Little Kern River, Tulare Co., *Jepson* 4918. S. Cal.: North Fork, Mt. Pinos, *Hall* 6464; Icehouse Cañon, upper San Antonio Cañon, *Peirson* 81; Snow Cañon, San Bernardino Mts., *Parish* 5060; Strawberry Valley, San Jacinto Mts., *Hall* 2204; Palomar Mt., *Parish* 4406; Mesa Grande, San Diego Co., *E. Ferguson* 64.

Var. **nevadensis** Wats. Plants slender, scarcely or not at all glandular; leaflets usually simply serrate; cyme open, the branches and pedicels slender, elongate; sepals usually lanceolate (rarely ovate); petals yellow.—Wet meadows or along streams, 4800 to 7000 feet; Yollo Bolly Mts.; Sierra Nevada from Tehama Co. to Tulare Co.; Mt. Pinos region to the San Jacinto Mts. June-Aug.

Locs.—Yollo Bolly Mts.: Castle Peak, ne. Mendocino Co., *Jepson* 128p. Sierra Nevada: Mineral, Tehama Co., *J. Grinnell;* Donner Lake, Nevada Co., *Heller* 6890; Dorrington, Calaveras Co., *Jepson* 10,068; Bench Mdw., Kaiser Ridge, Fresno Co., *Jepson* 13,261; Old Colony Mill, Tulare Co., *Jepson* 643. S. Cal.: Griffins, Mt. Pinos, *Elmer* 3978 (somewhat glandular); Prairie Fork, San Gabriel River, San Antonio Mts., *Johnston* 2066; Bluff Lake, San Bernardino Mts., *Munz* 10,442; Tahquitz Valley, San Jacinto Mts., *Hall* 2355.

Var. **lactea** Greene. Stems slender, scarcely glandular; leaflets simply serrate; cyme open, not leafy, the branches and pedicels elongated; calyx-lobes lanceolate; petals usually white or cream-color (sometimes turning yellow in drying), 6 to 8 lines wide, commonly much exceeding the sepals.—Moist meadows or slopes, about springs or along creeks, commonly at 4000 to 8500 (2500 to 11,350) feet: Humboldt, Trinity and Lake Cos.; Sierra Nevada from Sierra Co. to Kern Co.; San Gabriel Mts. Apr.-Aug.

Locs.—Coast Ranges: Mt. Hull, n. Lake Co., *Hall* 9554 (petals pale yellow); Dinsmore Ranch, Van Duzen River Valley, *Tracy* 4137; Trinity Summit, *Jepson* 2113; Dorleska, Salmon Mts., *Hall* 8598 (petals deep yellow). Sierra Nevada: Gold Lake, Sierra Co., *Hall & Babcock* 4499; Deer Park, Placer Co., *C. J. Fox Jr.;* Fallen Leaf Lake, *Ottley* 833; Fales Hot Sprs., Mono Co., *Ottley* 1113; Deadman Creek, Tuolumne Co., *Jepson* 6557; Piute Mt., Tuolumne Co., *Jepson* 4581; Little Yosemite, *Jepson* 3157; Huntington Lake, *A. L. Grant* 1031; Markwood Mdw., Fresno Co., *Crum* 1263; Alta Mdws., Tulare Co., *Newlon* 25a; Round Mdw., Giant Forest, *Jepson* 679; upper Kern River above Junction Mdw., *Jepson* 5028. S. Cal.: Prairie Fork, San Gabriel Mts., *Peirson* 2678.

Var. **austinae** Jepson nom. n. Stems tall but rather slender, 1½ to 2½ feet high; herbage sparingly pubescent to subglabrous, scarcely or not at all glandular; basal leaves 6 to 8½ inches long, usually 9 to 11-foliolate; leaflets simply, coarsely and rather deeply toothed; lateral leaflets suborbicular, entire at the base; cyme open, bracteate, the branches and pedicels elongated; calyx-lobes lanceolate to ovate-lanceolate; corolla sulphur-yellow, 7 to 9 lines wide.—(Folia radicalia unc. 6–8½ longa, fere 9–11 foliolata; foliola crasse et aliqnantum profunde dentata, dentibus simplicibus ovatis; foliola lateralia suborbiculata, ad basim integerrima; flores sulphureo-flavi, lin. 7–9 lati.)—Moist soil, valleys, 3400 to 5100 feet: Nevada Co. to Modoc Co.

Locs.—Truckee, *Sonne;* Quincy, Plumas Co., *Heller* 10,863 (type); Colby, Butte Co., *R. M. Austin* (flowers small); Pole Cañon, ne. Shasta Co., *Hall & Babcock* 4136; Willow Creek Valley, Modoc Co., *R. M. Austin*.

Var. **peirsonii** Jepson comb. n. Stems slender, 1 to 4 (or 8) inches high; herbage sparsely hirsutulose-pubescent and somewhat glandular; leaves mostly basal, 1 to 3½ inches long; leaflets cuneate- to orbicular-fanshaped, entire at base, crenately 3 to 7-toothed at apex; flowers about 3 lines wide; petals and calyx-lobes erect; bractlets minute; petals obovate-spatulate or oblong-spatulate, slightly clawed, exceeding the sepals; achenes reticulate-veined, ½ line long.—Lower borders of Transition zone into the Canadian zone, 6500 to 7400 feet: San Gabriel Mts. (South Fork Rock Creek, *Peirson* 493; Mt. Islip, *Peirson* 493a); San Bernardino Mts. June.

Var. **pumila** Jepson comb. n. Alpine dwarf 2 to 6 inches high; stems slender; herbage viscid-puberulent to glabrate; calyx-lobes usually ovate; petals 1 to 2 lines long.—Moist soil, 6500 to 8225 feet: Sierra Nevada from Tulare Co. to Modoc Co.; high inner North Coast Range. North to Oregon.

Locs.—Sierra Nevada: Mt. Whitney, *Purpus;* Truckee, Nevada Co., *Sonne;* Mt. Bidwell, Modoc Co., *Jepson* 7878. Inner North Coast Range: Snow Mt., n. Lake Co., *Purpus* 1226; South Yollo Bolly, *Jepson* 132p.

Refs.—POTENTILLA GLANDULOSA Lindl. Bot. Reg. t. 1583 (1833), type from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. 282 (1901), ed. 2, 209 (1911), Man. 486 (1925). *P. glandulosa* var. *genuina* Wolf, Biblio. Bot. 16^{71}:136 (1908). *P. glandulosa* var. *incisa* Lindl. Bot. Reg. t. 1973 (1837), type from Cal., *Douglas;* Jepson, Man. 487 (1925). *Drymocallis glandulosa* var. *incisa* Rydb. Mem. Dept. Bot. Columbia Univ. 2:199 (1898). *D. incisa* Rydb. N. Am. Fl. 22:374 (1908). Var. WRANGELLIANA Wolf, Biblio. Bot. 16^{71}:137 (1908); Jepson, Man. 487, fig. 481 (1925). *P. wrangelliana* Fisch. & Ave-Lall. Ind. Sem. Hort. Petrop. 7:54 (1840), type loc. Fort Ross, *Wrangell*, cult. from seed; Lehm. Rev. Pot. 49, t. 19 (1856). *Drymocallis wrangelliana* Rydb. Mem. Dept. Bot. Columbia Univ. 2:201, pl. 108 (1898). Var. REFLEXA Greene, Fl. Fr. 65 (1891), type loc. Sierra Nevada foothills. *P. reflexa* Greene, Pitt. 3:19 (1896). *Drymocallis reflexa* Rydb. Mem. Dept. Bot. Columbia Univ. 2:203, pl. 110 (1898). *D. viscida* Parish, Bot. Gaz. 38:460 (1904), type loc. Snow Cañon, San Bernardino Mts., *Parish* 5060 (sepals not reflexed). *D. laxiflora* Rydb. N. Am. Fl. 22:374 (1908), type loc. Big Tree Cañon, Tulare Co., *Coville & Funston* 1355 (more glandular). *P. laxiflora* Fedde, Just Bot. Jahresb. 36^{2}:494 (1908). *P. glandulosa* Jepson, Man. 486 (1925), in part. Var. NEVADENSIS Wats. Bot. Cal. 1:178 (1876), type loc. South Fork Kern River, *Rothrock;* Jepson, Man. 487 (1925). *Drymocallis glandulosa* var. *monticola* Rydb. Mem. Dept. Bot. Columbia Univ. 2:199 (1898). *D. monticola* Rydb. N. Am.

Fl. 22:370 (1908). *P. hanseni* Greene, Pitt. 3:20 (1896), "middle and high Sierras" (sepals ovate). *Drymocallis hanseni* Rydb. Mem. Dept. Bot. Columbia Univ. 2:200 (1898). *P. glandulosa* var. *genuina* f. *hansenii* Wolf, Biblio. Bot. 16^{71}:136 (1908). *P. glandulosa* var. *genuina* f. *monticola* Wolf, Biblio. Bot. 16^{71}:139 (1908). *P. monticola* Fedde, Just Bot. Jahresb. 36^{2}:494 (1908). Var. LACTEA Greene, Fl. Fr. 65 (1891), "higher elevations, Kern and Fresno Cos."; Jepson, Man. 487 (1925). *P. lactea* Greene, Pitt. 3:20 (1896). *Drymocallis lactea* Rydb. N. Am. Fl. 22:369 (1908). *P. glandulosa* var. *nevadensis* Wats. Bot. Cal. 1:178 (1876), in part; not P. nevadensis Boiss. (1838). *Drymocallis gracilis* Rydb. Bull. Torr. Club 28:177 (1901), type loc. Pine Ridge, Fresno Co., *Hall & Chandler* 138 (more glandular); not P. gracilis Dougl. (1830). *P. rupestris* var. *americana* Wolf, Biblio. Bot. 16^{71}:129 (1908). Var. AUSTINAE Jepson. *P. glandulosa* var. *fissa* Jepson, Man. 487 (1925), not P. fissa Nutt. (1840). Var PEIRSONII Jepson. *P. peirsonii* Munz, Bull. S. Cal. Acad. 31:65 (1932). *Drymocallis cuneifolia* Rydb. Mem. Dept. Bot. Columbia Univ. 2:204, pl. 111 (1898), type loc. Green Lead Mine, San Bernardino Mts., *Parish* 1818. *P. cuneifolia* Wolf, Biblio. Bot. 16^{71}:139 (1908); not P. cuneifolia Bertol. (1863). Var. PUMILA Jepson. *Drymocallis pumila* Rydb. N. Am. Fl. 22:372 (1908), type loc. Steins Mt., Ore., *Cusick* 2571. *P. pumila* Fedde, Just Bot. Jahresb. 36^{2}:494 (1908). *P. glandulosa* var. *monticola* Jepson, Man. 487 (1925); not Drymocallis glandulosa var. monticola Rydb. (1898) or Drymocallis monticola Rydb. (1908).

6. **P. saxosa** Lemmon. DESERT CINQUEFOIL. Stems slender, ascending, 4 to 7 inches high, these and the leaves tufted; herbage glandular-pubescent; leaves pinnate, the petioles ¾ to 2 inches long; leaflets 3 to 7 (or 9), broadly ovate or fan-shaped, crenate to deeply serrate, 3 to 6 lines long; cymes loose, few-flowered, somewhat leafy; flowers small and inconspicuous (2½ to 4 lines wide), on filiform often arcuate pedicels 4 to 9 lines long; braetlets ovate-acute to lanceolate, sometimes 2-cleft; petals lanceolate-acuminate to oblong-acute, white or light yellow, 1 to 1½ lines long, not surpassing the calyx-lobes; stamens 25 to 30; achenes 8 to 15, usually faintly ribbed.

Rock crevices, 300 to 6400 feet: ranges in or bordering the deserts from Mono Co. to the San Bernardino Mts. and southwards to Lower California. May-Aug.

Locs.—Benton Range, Mono Co., *Hall* 11,882; Sherwin Hill, Mono Co., *Peirson* 10,719; Deep Springs Valley, White Mts., *Purpus* 5813; Twenty-nine Palms, *Alverson;* Cactus Flat, San Bernardino Mts., *Munz* 10,501.

Refs.—POTENTILLA SAXOSA Lemmon; Greene, Pitt. 1:171 (1888), type loc. San Rafael Mts., L. Cal., *Lemmon;* Jepson, Man. 486 (1925). *Horkelia saxosa* Rydb. Mem. Dept. Bot. Columbia Univ. 2:155 (1898). *P. rosulata* Rydb. Bull. Torr. Club 26:542 (1899), type loc. Twenty-nine Palms, Colorado Desert, *A. H. Alverson.* *P. acuminata* Hall, Univ. Cal. Publ. Bot. 1:86 (1902), type loc. Chino Creek, Mt. San Jacinto, *Hall* 2605.

7. **P. rivalis** Nutt. RIVER CINQUEFOIL. Stems coarse, erect or ascending, usually simple below, 1 to 2 feet high; herbage soft-pubescent, sometimes a little glandular; leaves pinnate with 5 leaflets or the upper often ternate; leaflets oblong or obovate, usually twice as long as wide, incised-serrate or crenate, 1 to 1½ inches long; cyme leafy, much-branched, the branches tending to be falsely racemose; flowers about 2½ lines wide, borne on short pedicels; petals yellow, cuneate-obovate, ½ to ⅔ line long, much exceeded by the calyx-lobes; ripe achenes numerous, smooth or obscurely rugulose.

Bottom lands, 5 to 500 feet; lower Sacramento and San Joaquin rivers; Colorado Desert. North to British Columbia, south to Mexico. Jan.-Apr.

Locs.—Isleton, *Babcock;* Tracy, *Bioletti;* Cameron Lake, Colorado Desert, *T. Brandegee.*

Refs.—POTENTILLA RIVALIS Nutt.; T. & G. Fl. 1:437 (1840), type loc. Lewis River, *Nuttall;* Lehm. Rev. Pot. 196, pl. 61 (1856); Rydb. Mem. Dept. Bot. Columbia Univ. 2:42, pl. 7 (1898); Jepson, Man. 486 (1925). *Tridophyllum rivale* Greene, Lflts. 1:189 (1905).

8. **P. leucocarpa** Rydb. SAND SEED. Stems slender, prostrate, spreading or erect, freely branched from the base upward (the branches often floriferous to the base), ½ to 1½ feet high; herbage pubescent; leaves mostly cauline, all ternately compound, the petioles short (½ to 9 lines) or the basal and sub-basal to 1¼ inches long; leaflets cuneate-obovate, serrate-incised at apex (or above the middle), ½ to 1 inch long; cymes very leafy, the flowers numerous, congested towards the ends of the branches, appearing racemose; flowers 1½ to 2 lines wide, on pedicels 2 to 6

(or 9) lines long; petals oblong-cuneate, light yellow, ½ line long, shorter than the calyx-lobes; styles glandular-papillose; achenes numerous, smooth or faintly rugulose.

Bottom lands or moist places, 5 to 5000 feet: throughout California at widely scattered stations. North to Washington, east to New Mexico and Illinois. Mar.-Oct.

Locs.—Needles, *Jones* 3842; Estrella, San Luis Obispo Co., *Jared;* Tracy, *Bioletti;* Antioch, *Condit;* Laguna Puerca, Sonoma Co., *Bioletti;* Truckee, *Sonne* (approaching P. biennis in aspect and in shape of leaflets); Bloody Cañon, Mono Co., *Congdon* (leaves small, in shape approaching P. biennis); Fandango, Modoc Co., *Manning* (similar to preceding). Nev.: Candelaria, *Shockley* 675.

Refs.—Potentilla leucocarpa Rydb.; Britt. & Br. Ill. Fl. 2:212, fig. 1924 (1897); Mem. Dept. Bot. Columbia Univ. 2:43, pl. 8 (1898). *P. millegrana* Engelm.; Lehm. Delect. Sem. Hort. Hamb. 11 (1849), type loc. St. Louis, Mo.; Jepson, Fl. W. Mid. Cal. 282 (1901), ed. 2, 208 (1911), Man. 486 (1925); not P. millegrana Dougl. (1834). *P. rivalis* var. *millegrana* Wats. Proc. Am. Acad. 8:553 (1873).

9. **P. monspeliensis** L. Rough Cinquefoil. Stems erect or nearly so, leafy, 1 to 2 feet high; herbage more or less hirsute; leaves ternate; leaflets obovate (the upper narrower), coarsely dentate, ¾ to 1 inch long; cymes leafy, at first compact, later often spreading; flowers 4 to 6 lines wide; bractlets oblong; petals yellow, obovate to cuneate, 1½ to 2½ lines long; stamens 15 to 20, the filaments short, filiform; styles slender-conical; achenes many, nearly smooth, or usually striate with a distinctive pattern.

Moist spots, 4600 to 7300 feet: Butte Co.; Fresno Co.; Cuyamaca Mts., San Diego Co. British America, south in the Rocky Mts. to Mexico and east to the Atlantic. June-Aug. Introduced in California.

Locs.—Jonesville, Butte Co., *H. F. Copeland* 1066; Florence Lake, Fresno Co., *Jepson* 16,069; Cuyamaca Lake, San Diego Co., *Munz & Harwood* 7189.

Refs.—Potentilla monspeliensis L. Sp. Pl. 499 (1753), type from Montpelier, France (cult. in the Botanic Gardens at Montpelier, the seed from Virginia or Canada, acc. DC. Cat. Pl. Hort. Monsp. 135); Rydb. Mem. Dept. Bot. Columbia Univ. 2:45, pl. 10 (1898). *P. hirsuta* Michx. Fl. Bor. Am. 1:303 (1803), type loc. Quebec, Canada. *P. grossa* Dougl.; Hook. Fl. Bor. Am. 1:193 (1834) as synonym. *P. millegrana* Dougl. l.c. as synonym. *P. norvegica* var. *hirsuta* T. & G. Fl. 1:436 (1840). *Tridophyllum monspeliense* Greene, Lflts. 1:189 (1905).

10. **P. biennis** Greene. Meadow Cinquefoil. Coarse weedy herb, the stems strictly erect (rarely decumbent), branched from the base or the middle, ¾ to 2 feet high, more or less purplish, leafy; herbage thinly villous and minutely glandular; leaves all ternate, the petioles ½ to 3 inches long; leaflets broadly obovate to suborbicular, coarsely crenate, 4 to 11 lines long; cyme compactly erect, at least not spreading, the flowers solitary or clustered along the elongated branches and often appearing racemose; flowers small (3 lines broad), on pedicels 2 to 4 lines long; bractlets usually oblong; petals yellow (or white), cuneate to elliptical, 1 line long, shorter than the calyx-lobes; styles glandular-papillose; achenes numerous, whitish.

Moist flats or valleys, 5000 to 8400 feet: mountains bordering the west side of the Mohave Desert; east side or easterly summit valleys of the Sierra Nevada from Inyo Co. to Modoc Co. South to Lower California, east to the Rocky Mts., north to Saskatchewan. May-Aug.

Locs.—Mts. bordering w. side Mohave Desert: Bear Valley, San Bernardino Mts., *Parish* 7519; Griffins, Mt. Pinos, *Elmer* 3805; Bisses sta., Tehachapi Mts., *Dudley* 504. Sierra Nevada (easterly valleys or east side of): Panamint Cañon, Panamint Range, *Hall & Chandler* 7008; Monache Mdws., Tulare Co., *Hall & Babcock* 5222; Inyo Mts., *Purpus* 5788; North Fork Crooked Creek, White Mts., *Jepson* 7264; Bishop Creek, Inyo Co., *Hall & Chandler* 7228; Mammoth, Mono Co., *K. Brandegee;* Pickle Mdws., Mono Co., *Ottley* 1123; Donner Lake, *Heller* 6912; Egg Lake, sw. Modoc Co., *M. S. Baker;* Goose Lake Valley, Modoc Co., *Austin & Bruce* 2307.

Refs.—Potentilla biennis Greene, Fl. Fr. 65 (1891), type loc. "in the mountains from Butte Co. to Kern and San Luis Obispo"; Rydb. Mem. Dept. Bot. Columbia Univ. 2:44, pl. 9 (1898); Jepson, Man. 486 (1925). *P. laterifolia* Engelm.; Rydb. Bull. Torr. Club 23:261 (1896), type loc. Utah, *Engelmann. Tridophyllum bienne* Greene, Lflts. 1:189 (1905).

11. **P. pennsylvanica** L. var. **strigosa** Pursh. PRAIRIE CINQUEFOIL. Stems several, erect or ascending, 4 to 9 inches high; herbage pilose; leaves chiefly basal, the stems bearing 2 or 3 reduced leaves; stems and petioles pilose, the under side of leaves closely gray-pubescent, the upper side green and thinly pubescent; leaves pinnate, the blades 1 to 3 inches long, on petioles ½ to nearly as long; leaflets (5 or) 9 to 11, 8 to 11 lines long, broadly oblong, pinnately cleft to below middle into regular linear-oblong segments, the segments with revolute margins; cyme 5 to 7 (or 10)-flowered; flowers 3 to 5 lines wide, on ascending pedicels 5 to 10 lines long; petals yellow, erect, roundish-obovate, truncatish or obtuse, 1½ to 2 lines long; stamens 11 or 16 to 19.

Alpine meadows, 11,100 feet: White Mts. East to the Rocky Mts., north to Canada. July-Aug.

Locs.—White Mts.: County Line Hill, *Jepson* 7359. Utah: Bear River, Summit Co., *Payson* 4870.

Var. **ovium** Jepson var. n. Stems decumbent or diffuse, 2 to 6 inches high; root-crown densely and regularly imbricated with the persistent stipular scales, the scales red-brown, 9 lines long, 3 lines wide; leaflets usually 5, the teeth narrow, spreading or remote; cymes few-flowered, congested, the peduncles more or less recurved.—(Caules decumbentes vel decumbenti-ascendentes unc. 2–6 alti; foliola plerumque 5, dentibus angustis, patulis vel remotis; cymae pauciflorae, congestae, pedunculis plus minusve recurvati.)—Alpine slopes, 11,100 to 11,400 feet; White Mts. (Sheep Mt., *Jepson* 7307, type; North Fork Crooked Creek, *Jepson* 7342).

Refs.—POTENTILLA PENNSYLVANICA L. Mant. 1:76 (1767), type from Canada. Var. STRIGOSA Pursh, Fl. 356 (1814), type loc. "on the Missouri," *Lewis;* Rydb. Mem. Dept. Bot. Columbia Univ. 2:97, pl. 38 (1898); Jepson, Man. 487 (1925). *P. strigosa* Pall.; Pursh, l.c. as synonym; not P. strigosa Bunge (1830). Var. OVIUM Jepson.

12. **P. pseudosericea** Rydb. MONO CINQUEFOIL. Stems spreading, 1 to 4 inches long, these and the leaves caespitose; herbage densely white-silky; lower stipules brown and scarious; leaves palmate, sometimes a little pinnate; leaflets 5 or 3, divided into linear obtuse segments, 3 to 5 lines long; cyme few-flowered, congested, its branches and pedicels somewhat arcuate; flowers 3 lines wide; petals light yellow, obovate, 1 to 1½ lines long, equaling or slightly exceeding the calyx-lobes; stamens 20; styles thickish, glandular-papillose at base; achenes numerous.

Alpine slopes, 11,000 to 13,000 feet: Sierra Nevada (east side or easterly summits) from Tulare Co. to Mono Co.; White Mts. East to the Rocky Mts. July-Aug.

Tax. note.—The California plants usually referred to Potentilla rubricaulis Lehm. are here included in P. pseudosericea. P. rubricaulis, collected "about Bear Lake, latitude 66 in the American Arctic", has never been rediscovered. According to Wolf (Monog. Pot. 170), who saw the original specimens, the plants are about 8 inches high, the stems stoutish, the flowers 6 or 7 lines in diameter, the leaves 2 to 5 inches long—altogether a much more robust plant, and also with minor structural differences. It is no doubt closely related to P. pseudosericea Rydb. but the evidence indicates that these two names represent specifically distinct forms. A series of specimens from the White Mts., east of the Sierra Nevada, shows considerable variation in the amount of pubescence on the upper surface of the leaves but no specific distinctions.

Locs.—Sierra Nevada: Olancha Peak, Tulare Co., *Purpus* 1865; Mono Pass, *Theo. Labouchere.* White Mts.: McAfee Mdws., *Duran* 2616b; Sheep Mt., *Jepson* 7319; White Mountain Peak, *Jepson* 7389.

Var. **grandiflora** Wolf. Flowers 4 to 5 (or 7) lines broad, the petals much exceeding the sepals; styles stout.—Alpine meadows, 12,000 to 13,000 feet: White Mts. (Sheep Mt., *Jepson* 7314; Cottonwood Creek, *Duran* 1635; White Mountain Peak, *Jepson* 7394). This variety is very similar in aspect to P. breweri Wats., differing chiefly in the thicker and shorter styles, a sectional character. It ranges far northward.

Refs.—POTENTILLA PSEUDOSERICEA Rydb. Mem. Dept. Bot. Columbia Univ. 2:98, pl. 36, figs. 1–5 (1898), type loc. White Mts., Mono Co., Cal., *Shockley* 592 (erroneously attributed to Nevada by Rydberg); Jepson, Man. 488 (1925). *P. holosericea* Nutt.; Rydb. l.c., as synonym; not P. holosericea Griseb. (1843). *P. rubricaulis* Jepson, Man. 488 (1925), in part; not P. rubricaulis Lehm. (1830). Var. GRANDIFLORA Wolf, Biblio. Bot. 16^{II}:153 (1908), type from "North-west America."

13. **P. multijuga** Lehm. LOST CINQUEFOIL. Stems few, slender, ascending, 1 to 2 feet high; herbage strigose to glabrate; leaves pinnate; basal leaves many, the blades ⅓ to 1 foot long, with 11 to 27 leaflets, the petioles 2½ to 5 inches long;

stipules ovate; leaflets cuneate-obovate to fan-shaped, entire at the base, incised above into a few coarse unequal teeth, 5 to 20 lines long; cauline leaves reduced, few-foliolate or simple; cymes loose; pedicels ascending, 5 to 15 lines long; flowers 7 to 9 lines wide; petals yellow, cuneate-obovate, retuse, 3½ lines long, slightly exceeding the calyx-lobes; stamens about 20; pistils many; styles filiform, about twice as long as the mature achenes.

Brackish marshes or moist flats, 5 to 300 feet: Los Angeles coast.

Locs.—Los Angeles (Mem. Dept. Bot. Columbia Univ. 2:111); Ballona, *Hasse.*

Refs.—POTENTILLA MULTIJUGA Lehm. Ind. Sem. Hort. Hamb. 1849:6 (1849), type from Cal.; Rev. Pot. 29, t. 7 (1856); Rydb. Mem. Dept. Bot. Columbia Univ. 2:110, pl. 48 (1898); not P. multijuga Greene (1891), or Jepson (1901 and 1911).

14. **P. drummondii** Lehm. MOUNTAIN CINQUEFOIL. Stems erect or nearly so, few-leaved, slightly hairy, 5 to 12 (or 16) inches high; herbage green, soft-pubescent, the leaves usually silky when young; stipules ovate-lanceolate, about ¾ inch long; basal leaves pinnate, with approximate leaflets; cauline leaves with the leaflets often so crowded (especially when few) as to appear digitate, or the terminal sometimes confluent; petioles 1½ to 5 inches long; leaflets 5 to 9 (or 11), ½ to 1¾ inches long, oblong-obovate to roundish, cuneate at base, cleft into acute teeth or sometimes unequally and rather deeply laciniate into linear lobes; flowers long-pediceled, 8 to 9 lines wide; petals bright yellow, obcordate, exceeding the calyx-lobes; stamens about 20; achenes many.

High montane meadows or ridges, 6000 to 9000 feet: Sierra Nevada from Tulare Co. to Nevada Co.; North Coast Ranges from Humboldt Co. to Siskiyou Co. North to British Columbia. June-Aug.

Locs.—Sierra Nevada: Hockett Mdws., Tulare Co., *Hall* 8461; Cold Creek, Placer Co., *Sonne;* Donner Lake, *Davy* 3196. North Coast Ranges: Trinity Summit, *Manning* 60; Marble Mt., w. Siskiyou Co., *Chandler* 1564.

Refs.—POTENTILLA DRUMMONDII Lehm. Stirp. Pug. 2:9 (1830), type loc. "Rocky Mountains north of the Smoking River, latitude 56," *Drummond;* Hook. Fl. Bor. Am. 1:189, pl. 65 (1834); Rydb. Mem. Dept. Bot. Columbia Univ. 2:109, pl. 47 (1898); Jepson, Man. 487 (1925). *P. dissecta* B. & W. Bot. Cal. 1:179 (1876), in part; not P. dissecta Pursh (1814). *P. dissecta* var. *drummondii* Kurtz, Bot. Jahrb. 19:374 (1894). *P. drummondii* var. *genuina* Wolf, Biblio. Bot. 16^{71}:492 (1908).

15. **P. hickmanii** Eastw. DIPPER CINQUEFOIL. Stems several from the base, decumbent, 2 to 4 (or 12) inches long, the leaves mostly basal; herbage sparingly strigose; leaves pinnate, the blades 1 to 7 inches long; petioles ½ to 5 inches long; leaflets 7 to 11, suborbicular with broadly cuneatish base, palmately 3 to 4-cleft or -parted, 4 to 8 (or 13) lines long; cymes open, few-flowered; flowers 6 to 11 lines wide; pedicels slender, 2 to 13 lines long, arcuate-spreading in fruit; petals obcordate or cuneate-emarginate, golden yellow, 2 to 3½ lines long; stamens 20; achenes usually 10 to 15.

Low hills, usually in pine woods, 5 to 100 feet: along the coast from San Mateo Co. to Monterey Co. Apr.-June.

Field note.—This narrow endemic has been rarely collected. The two known stations are in San Mateo Co. (Moss Beach, *K. Brandegee*) and in Monterey Co. On June 5, 1932, it was found growing luxuriantly in an opening in the Monterey Pine forest at Pacific Grove (*Crum* 1406) where the plants trailed down a streamlet and attained their best development in the marshy soil of a miniature flood plain. On higher ground under the pines, where the soil was dry, a few stunted specimens were seen. The plants were blooming profusely, the corollas bright golden yellow, varying considerably in size on the same individual.

Refs.—POTENTILLA HICKMANII Eastw. Bull. Torr. Club 29:77 (1902), type loc. Pacific Grove, Monterey Co., *Eastwood;* Wolf, Biblio. Bot. 16^{71}:496, t. 5, fig. 1 (1908); Jepson, Man. 488 (1925).

16. **P. millefolia** Rydb. FEATHER CINQUEFOIL. Stems several from the base, slender, diffuse or prostrate, 3 to 6 (or 9) inches long; herbage sparingly villous or the leaves glabrous; leaves pinnate, the blades oblong in outline, 1½ to 7 inches long, the petioles about 3 to 6 lines long; leaflets about 9 to 15, parted into 2 to 5

linear acute segments, 4 to 7 lines long; cauline leaves more shortly petioled, or subsessile, their leaflets usually much fewer, often entire; cyme open, few-flowered; flowers about 6 to 10 lines wide; pedicels slender, arcuate and often elongated in fruit; petals yellow or yellowish, obcordate, exceeding the calyx-lobes; stamens about 20; achenes 25 to 40.

Mountain valleys, 4300 to 5700 feet: Siskiyou Co.; Sierra Nevada from Nevada Co. to Modoc Co. June-July.

Locs.—Siskiyou Co.: Mayten, *Alexander & Kellogg* 110; Edgewood, *Curran*. Sierra Nevada: Dassonville, Nevada Co., *Sonne;* Prattville, Plumas Co., *T. Brandegee*.

Var. **klamathensis** Jepson comb. n. Herbage grayish, the hairs spreading.—Northeastern Shasta Co. (Fall River Valley, *Baker & Nutting*). North to southern Oregon.

Var. **densa** Jepson var. n. Stems caespitose-prostrate, 1½ to 2 inches long; segments of leaflets shorter, oblong, acutish or obtuse, 2½ to 3½ lines long; bractlets broadly oblong, obtuse, equaling the calyx-lobes.—(Caules caespitosi, prostrati, unc. 1½–2 longi; foliolorum segmenta breviora, oblonga, acuta vel obtusa, lin. 2½–3½ longa; bracteolae late oblongae, sepalis aequantae.)—Montane meadows, 6000 to 7000 feet: Norval Flat, sw. Lassen Co., *Robinson* 7 (type).

Var. **algida** Jepson var. n. Similar to var. densa; stems elongated (3 to 7 inches long), remotely leafy; flowers 6 to 8 lines wide; bractlets narrow-oblong, somewhat obtuse, ½ to ¾ as long as the calyx-lobes.—(Caules elongati (unc. 3–7 longi), remote foliosi; flores lin. 6–8 lati; bracteolae anguste-oblongae, obtusiusculae, sepalis ¼–½ breviores.)—Glacial meadow, 6500 feet: North Fork Swift Creek, Salmon Mts., n. Trinity Co., *Hall* 8698 (type).

Refs.—POTENTILLA MILLEFOLIA Rydb. Bull. Torr. Club 23:433, pl. 277, figs. 1–5 (1896), type loc. Sierra Valley, *Lemmon* 86; Rydb. Mem. Dept. Bot. Columbia Univ. 2:105, pl. 43, figs. 1–5 (1898). *P. plattensis* var. *millefolia* Jepson, Man. 488 (1925). Var. KLAMATHENSIS Jepson. *P. klamathensis* Rydb. N. Am. Fl. 22:343 (1908), type loc. Fort Klamath, Ore., *Leiberg* 660. *P. plattensis* var. *klamathensis* Jepson, Man. 488 (1925). Var. DENSA Jepson. Var. ALGIDA Jepson.

17. **P. breweri** Wats. SIERRA CINQUEFOIL. Stems from a stout scaly root-crown, horizontally spreading or diffuse, 4 to 14 (or 20) inches long; herbage, especially the leaves, silky-villous, or silvery-tomentose when young; leaves pinnate, the blades ¾ to 3 inches long, the petioles ½ to as long; leaflets 7 to 13, crowded or discrete, cuneate, deeply incised, 3 to 6 lines long; stipules ovate to oblong, 3 to 9 lines long, 1 to 3 lines wide, entire or cleft; flowers 6 to 8 lines wide; petals yellow, roundish, retuse, or obcordate with obtuse sinus; stamens 20; styles slender, 1⅛ lines long; achenes 20 to 25.

Moist meadows, 700 to 13,000 feet: Siskiyou Co.; Sierra Nevada from Lassen Co. to Tulare Co. June-Sept.

Locs.—Siskiyou Co.: Log Lake, *Butler* 1520; Shackelford Cañon, *Jepson* 2815. Sierra Nevada: Mt. Shasta, *H. E. Brown* 472; Bridge Creek, Lassen Co., *Baker & Nutting;* betw. Mt. Tallac and Gilmore Lake, Eldorado Co., *Ottley* 886; Soda Springs Cañon, Kennedy Lake, Tuolumne Co., *A. L. Grant* 546; Mt. Dana, *Jepson* 3318; Mono Pass, *Jepson* 4467; Mt. Lyell, *Jepson* 3335; Vogelsang Pass, *Jepson* 4429i; Evolution basin, *E. Ferguson;* Kearsarge Pass, *Jepson* 863; Hockett Mdw., Tulare Co., *Culbertson* 4458. Alpine plants are sometimes extremely reduced in all parts and densely tomentose: Hornbrook, Siskiyou Co., *Howell;* Whitney Mdws. (mts. above), Tulare Co., *Purpus* 1652.

Var. **expansa** Wats. Robust, erect, 6 to 10 inches high; leaves larger; leaflets fewer, approximate; herbage green and lightly silky, scarcely tomentose; pedicels elongated.—Upper Tuolumne River basin: Mt. Lyell, *Jepson* 3351; Tuolumne Mdws., *Jepson* 4472.

Var. **viridis** Jepson. Plants 2 to 5 inches high; herbage mostly green; leaflets sparingly or sometimes densely silky with straight hairs.—Alpine, 8500 to 11,600 feet: Sierra Nevada, easterly summits from Tuolumne Co. to Tulare Co.

Locs.—Mt. Dana, *Jepson* 3310; Mt. Lyell, *Jepson* 3336; Bullfrog Lake, Fresno Co., *Jepson* 846; Junction Mdw., Kern Cañon, *Jepson* 5027.

Refs.—POTENTILLA BREWERI Wats. Proc. Am. Acad. 8:555 (1873), type loc. Mono Pass, *Brewer* 1720; Jepson, Man. 487, fig. 482 (1925). Var. EXPANSA Wats. Bot. Cal. 1:179 (1876), type loc. Sierra Co., *Lemmon;* Jepson, Man. 488 (1925). *P. plattensis* var. *leucophylla* Greene, Erythea 1:5 (1893), type loc. Independence Lake, Nevada Co., *Sonne*. Var. VIRIDIS Jepson, Man. 487 (1925), type loc. Volcano Creek, Mt. Whitney, Tulare Co., *Jepson* 4950.

18. **P. flabellifolia** Hook. ALPINE FAN-FOIL. Stems slender, spreading or ascending, 2½ to 7 (or 14) inches high; herbage finely pubescent or glabrate; leaves few, mostly basal, on petioles ½ to 5½ inches long; leaflets 3, all sessile or

nearly so (or the middle leaflet stalked), fan-shaped, incisely and somewhat obtusely many-toothed, thin, ½ to 1½ inches long; cyme 1 to 3-flowered, loose; flowers 8 to 10 lines wide; petals bright yellow, deeply notched at apex, 3½ to 5 lines long; stamens about 20; achenes reddish-brown.

High montane in pine woods or subalpine in moist meadows, 7300 to 12,200 feet: Sierra Nevada from Tulare Co. to Shasta Co.; Siskiyou Co. North to British Columbia. June-Aug.

Locs.—Sierra Nevada: Lost Creek, Sawtooth Range, *Jepson* 4994; Mt. Silliman, Tulare Co., *Jepson* 754; Nellie Lake, Fresno Co., *A. L. Grant* 1089; Kaiser Peak, *A. L. Grant* 1443; Parker Pass, Madera Co., *A. L. Grant* 1599; Vogelsang Pass, *Jepson* 4429k; Clouds Rest, Yosemite, *Drew;* Dana Fork, Tuolumne River, *Jepson* 3257; Smedberg Lake, Tuolumne Co., *Jepson* 3379; Heather Lake, Eldorado Co., *Ottley* 1150; Silver Valley, Alpine Co., *Jepson* 10,156; Tinker's Knob, Placer Co., *Sonne;* Bear Creek, Truckee River, Placer Co., *Sonne* 78; Lassen Peak, *R. M. Austin* 492. Siskiyou Co.: Mt. Shasta (N. Am. Fauna 16:149); Marble Mt., *Butler* 1714 (glabrate).

Var. **grayi** Jepson. Stems 2 to 5 (or 8) inches high; leaves glabrous or nearly so, on petioles ¼ to 1 inch long; leaflets coarsely and acutely 5 to 7-toothed (the teeth somewhat triangular), 3 to 9 lines long, the terminal leaflet distinctly stalked.—High montane, 8000 to 10,000 feet: Sierra Nevada from Mariposa Co. to Tulare Co. June-Aug.

Locs.—Lake Tenaya, Yosemite, *Brewer* 1685; Crescent Lake, Mariposa Co., *Congdon;* Black Mt., Fresno Co., *Hall & Chandler* 615; Hockett Mdws., Tulare Co., *Purpus* 1826.

Refs.—POTENTILLA FLABELLIFOLIA Hook.; T. & G. Fl. 1:442 (1840), type loc. summit of Mt. Rainier, Wash., *Douglas;* Lehm. Rev. Pot. 153, t. 51 (1856); Rydb. Mem. Dept. Bot. Columbia Univ. 2:77, pl. 31, figs. 6–10 (1898); Jepson, Man. 489, fig. 484 (1925). *P. gelida* Wats. Bot. Cal. 1:180 (1876), type loc. Summit sta., Nevada Co., *Bolander;* not P. gelida Meyer (1831). Var. GRAYI Jepson, Man. 490 (1925). *P. grayi* Wats. Proc. Am. Acad. 8:560 (1873), type loc. "Yosemite Valley," *Bolander;* Rydb. l.c. 105, pl. 44, figs. 6–10. *P. clarkiana* Kell. Proc. Cal. Acad. 7:94 (1876), type loc. not stated, but actually mts. of Fresno Co., the only Sierran area where Eisen collected in the seventies.

19. **P. wheeleri** Wats. Kern Cinquefoil. Stems several from the base, decumbent or prostrate, leafy, 1 to 6 (or 10) inches long; herbage densely silky-villous; leaves digitate, 3 to 5-foliolate; petioles ½ to 3 inches long; leaflets cuneate, 3 to 5- toothed or -cleft at the rounded summit, 4 to 10 lines long (very unequal in size on a plant); stipules entire or nearly so; cyme much-branched, the branches and pedicels slender, usually more or less arcuate; flowers 3½ to 5 lines wide; petals yellow, obcordate, 1¾ to 2½ lines long, slightly exceeding the calyx-lobes; stamens 20, the filaments short; achenes many (about 30), pale, usually striate.

High montane, 6500 to 11,400 feet: Sierra Nevada in Tulare Co.; San Bernardino Mts.; San Jacinto Mts. South to Lower California. June-Aug.

Locs.—Volcano Creek, Tulare Co., *Jepson* 4949; Monache Creek, Tulare Co., *Hall & Babcock* 5284; Bear Valley, San Bernardino Mts., *Parish* 2363; South Fork Santa Ana River, *Peirson* 3113; Tahquitz Peak, San Jacinto Mts., *F. M. Reed* 2529 (var. rimicola M. & J.).

Var. **paupercula** Jepson. Alpine dwarf; stems about 1 inch long; leaflets folded, densely silky, 1½ to 2½ lines long; cymes dense, glomerate, about 5-flowered.—Granite gravel, 11,400 feet: Mt. San Gorgonio summit, *Blasdale.*

Refs.—POTENTILLA WHEELERI Wats. Proc. Am. Acad. 11:148 (1876), type loc. headwaters of Kern River, *Rothrock;* Bot. Wheeler 360, pl. 3B, figs. 4–7 (1878); Rydb. Mem. Dept. Bot. Columbia Univ. 2:54, pl. 16, figs. 1–5 (1898); Jepson, Man. 488 (1925). *P. wheeleri* var. *typica* M. & J. Bull. S. Cal. Acad. 24:18 (1925). *P. wheeleri* var. *viscidula* Rydb. Bull. Torr. Club 23:429 (1896), type loc. Arizona (probably as to California spms. cited). *P. viscidula* Rydb. N. Am. Fl. 22:327 (1908). *P. wheeleri* var. *rimicola* M. & J. l.c. 19, type loc. Dark Cañon, San Jacinto Mts., *Munz & Johnston* 8764 (herbage glandular, pedicels very slender). Var. PAUPERCULA Jepson, Man. 488 (1925), type loc. summit of San Gorgonio, *W. C. Blasdale.*

20. **P. diversifolia** Lehm. Painters Cinquefoil. Stems erect or erect with ascending base, 6 to 11 inches high, the leaves mostly basal; herbage villous-pubescent; leaves pinnate or the leaflets approximate at summit of the petiole and thus digitate; petioles 1 to 3 inches long; leaflets 5 to 7, oblanceolate or cuneate-obovate, ½ to 1½ or 2 inches long, green on both faces, the margin cut into triangular or lanceolate teeth; cyme few- to many-flowered, branched, at first con-

gested, later corymbose-spreading; flowers 7 to 9 lines wide; petals yellow, obcordate, or obovate and emarginate, about ⅓ longer than the calyx-lobes; stamens 20; achenes many, somewhat reticulate.

Montane, 6500 to 8600 feet: Sierra Nevada from Mariposa Co. to Lassen Co. East to Colorado, north to Canada. June-July.

Locs.—Tuolumne Soda Sprs., *Brewer* 1708; Lake Valley, near Lake Tahoe, *M. S. Baker;* Deer Park, Placer Co., *Helen Geis* 37; Eagle Lake (mts. s.), *Baker & Nutting.*

Var. **glaucophylla** Lehm. Herbage glaucous, often silky-strigose when young, becoming glabrate; leaves digitate; leaflets narrowly oblong-cuneate, the margin usually white-silky.—High montane, 8500 to 11,600 feet: Sierra Nevada from Inyo Co. (Cottonwood Lakes, *J. Grinnell*) and Tulare Co. (Volcano Creek, *Jepson* 4950a) to Mariposa Co. (Mt. Lyell, *Jepson* 3350; Mt. Dana, *Jepson* 3318a) and Mono Co. (Bloody Cañon, *Jepson* 4437).

Refs.—POTENTILLA DIVERSIFOLIA Lehm. Stirp. Pug. 2:9 (1830), type loc. (acc. Lehm. Rev. Pot. 72, pl. 31,—1856), "alpine prairies as well as the higher summits of the Rocky Mts. between latitudes 52 and 56," *Drummond. P. dissecta* Nutt. Jour. Acad. Phila. 7:21 (1834), type loc. "Kamas Prairie toward the sources of the Columbia," *Wyeth;* Jepson, Man. 488 (1925) in part; not P. dissecta Pursh (1814). *P. campestris* Nutt.; T. & G. Fl. 1:439 (1840) as synonym. *P. diversifolia* var. *genuina* Wolf, Biblio. Bot. 16^{71}:501 (1908). Var. GLAUCOPHYLLA Lehm. Stirp. Pug. 9:44 (1851). *P. glaucophylla* Lehm. Delect. Sem. Hort. Bot. Hamb. 1836:7 (1836), type loc. "plains of the first chain of the Rocky Mts., called the Black Hills." *P. dissecta* var. *glaucophylla* Wats. Proc. Am. Acad. 8:556 (1873); Rydb. Mem. Dept. Bot. Columbia Univ. 2:61, pl. 19, figs. 6–10 (1898).

21. **P. gracilis** Dougl. SILVER CINQUEFOIL. Stems erect or nearly so, 1 to 1½ feet high, hirsute-pubescent with upwardly appressed or sub-appressed hairs; leaves digitately 5 to 7-foliolate, the basal long-petioled, tufted, the cauline 1 or 2, often subsessile; leaflets oblanceolate or oblong, deeply pinnatifid-serrate with the teeth pointing upward, ¾ to 2¼ inches long, in the typical form with the upper surface very dark green and thinly hairy and the lower surface finely and densely white-tomentose and also hirsute, especially along the veins; cyme much-branched, loose, many-flowered; flowers 7 to 10 lines wide; petals yellow, obcordate, exceeding the calyx-lobes; stamens 20 to 29; achenes many, smooth.

Stream banks, valley flats or moist slopes, 2500 to 4700 feet: northern California from Mendocino Co. and eastern Humboldt Co. to Lassen and Modoc Cos. North to Washington, east to western Montana. June-Aug.

Locs.—Sherwood Valley, Mendocino Co., *Davy* 5158; Lasseck Peak, Humboldt Co., *Goddard* 668 (good match for the original illustration, Bot. Mag. pl. 2984); Hupa Valley, *Chandler* 1390; Sisson, Siskiyou Co., *Jepson* 102p; Fort Bidwell, Modoc Co., *Jepson* 7911; Alturas, South Fork Pitt River, *Taylor & Bryant;* Amedee, Lassen Co., *Davy.*

Note on variation.—Pubescence is variable in Potentilla gracilis and markedly so in var. hallii Wolf. The stems may be hirsute or villous with upwardly appressed, ascending or spreading hairs. Depth of toothing of the margin varies somewhat; but neither toothing nor pubescence character is associated with other characters in a definite manner. The leaves in the form described as P. etomentosa Rydb. are mostly greener than in the var. hallii Wolf but usually less hairy.

Var. **hallii** Wolf. CALIFORNIA CINQUEFOIL. Leaves greenish or green, villous above and below, usually thinly so.—Moist meadows, 3500 to 9000 feet: North Coast Ranges from Lake Co. to Siskiyou Co.; Sierra Nevada from Modoc Co. to Tulare Co.; Tehachapi Mts.; White Mts.; cismontane Southern California. June-Aug.

Locs.—North Coast Ranges: Thistle Sprs., Mt. Sanhedrin, Lake Co., *Heller* 5884; Soldiers Ridge, se. Trinity Co., *Jepson* 14,172; Salmon River, Siskiyou Co., *Alexander & Kellogg* 247. Sierra Nevada: Mineral, Tehama Co., *Jepson* 12,338; Colby, Butte Co., *R. M. Austin;* Prattville, Plumas Co., *Jepson* 4131; Bear Valley, Nevada Co., *Jepson* 14,174; Donner Lake, Nevada Co., *Heller* 6889, 6927; Cascade, Lake Tahoe, *Chesnut & Drew;* Carson Pass, Alpine Co., *Jepson* 8105; Kennedy Mdws., Tuolumne Co., *Jepson* 6540; Mt. Dana, Tuolumne Co., *Brewer* 5036; Hetch-Hetchy, *Jepson* 3469; Yosemite Valley, *Jepson* 4264a; Huckleberry Creek, Huntington Lake, *Jepson* 13,066; Quail Mdw., Mono Creek, Fresno Co., *Jepson* 13,198; Lake Florence, South Fork San Joaquin River, *Jepson* 16,062; Simpson Mdw., Middle Fork Kings River, *Henrietta Eliot;* Round Mdw., Giant Forest, *Jepson* 709; Alta Mdws., Tulare Co., *Newlon* 25; Volcano Creek, Tulare Co., *Jepson* 4939. White Mts.: Poison Creek, *Jepson* 7369. Tehachapi Mts.: Bisses sta., *Dudley* 436. S. Cal. mts.: Big Pines, Swartout Valley, San Gabriel Mts., *Peirson*

3165; Little Bear Valley, San Bernardino Mts., *Chandler;* Tahquitz Valley, San Jacinto Mts., *Jepson* 2297; French Valley, Palomar Mt., *Hall* 1946; Laguna Mts., e. San Diego Co., *T. Brandegee.*

Var. **elmeri** Jepson comb. n. Stems scantily villous; leaflets pectinately divided deeply or often almost to the midrib into linear-oblong segments, white-silky beneath or greenish silky.—Meadows, 4200 to 7600 feet: mountains bordering west side of Mohave Desert; east side or high easterly valleys of the Sierra Nevada in Fresno and Inyo Cos. East to Utah.

Locs.—Bear Lake, San Bernardino Mts., *Munz* 10,458; Mt. Pinos, *Hall* 6419; Lower Hot Sprs., South Fork San Joaquin River, *Jepson* 13,185; Bishop Creek, Inyo Co., *Shockley* 436.

Refs.—POTENTILLA GRACILIS Dougl.; Hook. Bot. Mag. pl. 2984 (1830), type loc. banks of the Columbia River, *Douglas;* Rydb. Mem. Dept. Bot. Columbia Univ. 2:68, pl. 24 (1898); Jepson, Man. 489 (1925) in part. *P. gracilis* var. *typica* Wolf, Biblio. Bot. 16^{71}:211 (1908). *P. blaschkeana* Turcz.; Lehm. Hamb. Gart. & Blumenz. 9:506 (1853), type loc. Russian settlement, i. e. Ft. Ross, *Blaschke;* Lehm. Rev. Pot. 107, t. 64 (1856). *P. gracilis* var. *blaschkeana* Jepson, Man. 489 (1925) in part. Var. HALLII Wolf, Biblio. Bot. 16^{71}:211 (1908); Jepson, Man. 489 (1925). *P. hallii* Rydb. Bull. Torr. Club 28:176 (1901), type loc. Pine Ridge, Fresno Co., *Hall & Chandler* 182. *P. dascia* Rydb. N. Am. Fl. 22:313 (1908), type loc. The Dalles, Ore., *Harford & Dunn* 1144. *P. gracilis* var. *rigida* Wats. Proc. Am. Acad. 8:557 (1873), in part; Jepson, Man. 489 (1925) in part; not P. rigida Nutt. (1818) or P. nuttallii Lehm. (1851). *P. angustata* Rydb. N. Am. Fl. 22:311 (1908), type loc. upper Sacramento River, *F. H. Foster.* *P. subvillosa* Rydb. l.c. 316 (1908), type loc. Carson Spur, Alpine Co., *Hansen* 297 (leaflets more deeply dissected). *P. lasia* Rydb. N. Am. Fl. 22:314 (1908), type loc. Bear Valley, San Bernardino Mts., *Parish* 3252 (leaflets few-toothed). *P. etomentosa* Rydb. Bull. Torr. Club 24:8 (1897), type from Cal., *Fremont* 162. *P. amadorensis* Rydb. N. Am. Fl. 22:312 (1908), type loc. Bear River, Amador Co., *Hansen* 1946. *P. gracilis* var. *blaschkeana* Jepson, Man. 489 (1925), in part; not P. blaschkeana Turcz. (1853). *P. bakeri* Rydb. Bull. Torr. Club 31:560 (1904), type loc. Grizzly Creek, Colo., *C. F. Baker;* (at least as to California spms. so determined by Rydberg). *P. comosa* Rydb. N. Am. Fl. 22:316 (1908), type loc. Bear Valley, San Bernardino Mts., *Parish* 3152 (pubescence of stems and petioles very dense, spreading). *P. parishii* Rydb. l.c. 313, type loc. Descanso, San Diego Co., *Parish* 4523. *P. hassei* Rydb. l.c. 329 (1908), type loc. Strawberry Valley, Mt. San Jacinto, Riverside Co. (formerly San Diego Co.), *Hasse* 5696. *P. gracilis* var. *fastigiata* Jepson, Man. 489 (1925), in part; not P. fastigiata Nutt. (1840). Var. ELMERI Jepson. *P. elmeri* Rydb. N. Am. Fl. 22:315 (1908), type loc. Mt. Pinos, n. Ventura Co., *Elmer* 4009. *P. gracilis* var. *blaschkeana* Jepson, Man. 489 (1925), in part; not P. blaschkeana Turcz. (1853). Perhaps *P. pectinisecta* Rydb. Bull. Torr. Club 24:7 (1897), type loc. (acc. N. Am. Fl. 22:317,—1908) Salt Lake City, Utah, *Jones* 1765.

POTENTILLA RECTA L. Sp. Pl. 497 (1753), type from Italy. This European species differs from the American P. gracilis complex in the characteristic pubescence of the stems (which consists of both long and short hairs), and in the short thick styles.—Adventive: Saratoga, Santa Clara Co., *Pendleton.*

22. **P. flabelliformis** Lehm. Spread Cinquefoil. Stems strictly erect or nearly so, 1¾ to 2½ feet high, thinly silky-strigose; leaves digitate, green above and appressed-hairy, white below with a felt-like tomentum, the veins silky-hairy; leaflets 5 to 7, 2½ to 3½ inches long, pectinately divided into narrowly linear lobes, the lobes spreading, generally stiffish and with finely revolute margins; cyme mostly loose, sometimes dense, usually many-flowered, at first congested, later corymbose-spreading; flowers 7 to 8 lines broad; petals yellow, obcordate, a little exceeding the calyx-lobes; stamens 20; styles slender, slightly dilated at base; achenes many, smooth.

Mountain valleys, 300 to 4500 feet: Modoc Co. North to British Columbia and Saskatchewan, east to Wyoming. June-July.

Locs.—Forestdale, *M. S. Baker;* Egg Lake, *Baker & Nutting.*

Tax. note.—No type specimen was named for Potentilla flabelliformis var. ctenophora Rydb. but examination of nine specimens from the New York Botanical Garden Herbarium so annotated by Rydberg indicates that the segregate very well represents P. flabelliformis as understood by Lehmann. It is not synonymous with P. blaschkeana Turcz. as later disposed of by Rydberg. This latter plant as indicated by the original illustration and description is a variant of the P. gracilis group. The Inyo County specimen cited below as the type of var. inyoensis shows on the whole a closer relation to P. flabelliformis than to P. gracilis, although it is in many respects similar to P. gracilis var. elmeri of the same region, and perhaps a parallel variant.—E. K. Crum.

Var. **inyoensis** Jepson var. n. Leaflets sparsely hairy beneath (rarely sparingly tomentulose), the segments broader, the margin not revolute.—Wet meadows, 4000 to 4400 feet: Inyo Co. (Bishop, *Hall & Chandler* 7279, type; White Mts., *Duran* 2503).

Refs.—Potentilla flabelliformis Lehm. Stirp. Pug. 2:12 (1830), type loc. Saskatchewan; Monog. Pot. suppl. 1, pl. 6 (1835); Rydb. Mem. Dept. Bot. Columbia Univ. 2:74, pl. 28, figs. 1–5 (1898); Jepson, Man. 489 (1925). *P. gracilis* var. *flabelliformis* Nutt.; T. & G. Fl. 1:440 (1840). *P. flabelliformis* var. *typica* Wolf, Biblio. Bot. 16^{71}:214 (1908). *P. flabelliformis* var. *tenuior* Lehm. Rev. Pot. 108 (1856), "asservatur in herb. Colmanniano." *P. flabelliformis* var. *typica* f. *tenuior* Wolf, l.c. *P. flabelliformis* var. *ctenophora* Rydb. Bull. Torr. Club 24:7 (1897), "Wyoming to British Columbia and Saskatchewan". *P. ctenophora* Rydb. Mem. Dept. Bot. Columbia Univ. 2:75, pl. 28, fig. 6 (1898). Var. inyoensis Jepson. *P. flabelliformis* var. *ctenophora* Jepson, Man. 489 (1925); not P. flabelliformis var. ctenophora Rydb. (1897), or P. ctenophora Rydb. (1898).

VI. Subgenus **Ivesia.** Leaflets many to numerous, small, usually crowded or imbricated, commonly palmately cleft or divided, 1 to 4 lines long; calyx-tube mostly campanulate or bowl-shaped; petals white or yellow; stamens 5 to 20; filaments filiform (except 2 species); style terminal or nearly so; pistils 1 to 15, rarely 20 to 25.

23. **P. purpurascens** Greene. Summit Ivesia. Stems erect, 6 to 15 inches high, with mostly basal leaves; herbage pubescent and somewhat villous or slightly grayish; leaves pinnate, the blades 2 to 8 inches long, the petioles ½ to 1¼ inches long; leaflets numerous, usually closely crowded, 2 to 4-parted into oblong-oblanceolate divisions, 2 to 3 lines long; cyme few-flowered, simple or dichotomously branched, with the clusters open or somewhat congested; flowers 6 to 7 lines wide; calyx-tube purplish, bowl-shaped, 2 to 2½ lines wide; bractlets small and narrow; petals white or purple-tinged, rotate, broadly cuneate-oblong, truncate or slightly retuse, 3 lines long; stamens 20, those opposite the calyx-lobes longest; filaments subulate-dilated, often scabrous or minutely pubescent; receptacle hairy, conical; achenes 20 to 25.

Margins of summit valleys and meadows, 6600 to 9000 feet; eastern Tulare Co. June-Aug.

Locs.—Volcano Creek, *Jepson* 959; Trout Mdws., *Hall & Babcock* 5408 (herbage densely pubescent); Clicks Creek, Little Kern River, *Hall & Babcock* 8373; Kern River flat, *Culbertson* 4309 (herbage nearly glabrous); Monache Mdws., *Hall & Babcock* 5219.

Var. **congdonis** Jepson. Stems more strictly erect, ¾ to 2 feet high; herbage minutely hirsutulous and glandular; leaves 2½ to 9 inches long, sometimes with very densely crowded leaflets, thus becoming terete in outline; cymes more congested, corymbose to subcapitate; calyx-lobes less regularly reflexed.—East side or easterly summits of the southern Sierra Nevada in Mono, Inyo and Tulare Cos.

Locs.—Casa Diablo, Mono Co., *Congdon;* McGee Mdws., Inyo Co., *K. Brandegee* (leaflets much reduced, densely imbricate); Long Valley, Inyo Co., *K. Brandegee;* upper Bishop Creek, Inyo Co., *K. Brandegee;* Alta Mdws., Tulare Co., *K. Brandegee.*

Refs.—Potentilla purpurascens Greene, Pitt. 1:105 (1887); Jepson, Man. 491 (1925). *Horkelia purpurascens* Wats. Proc. Am. Acad. 11:148 (1876), type loc. headwaters of Kern River, *Rothrock;* Rothrock, Bot. Wheeler 360, pl. 3A, figs. 1–3 (1878); Rydb. Mem. Dept. Bot. Columbia Univ. 2:143, pl. 82 (1898). *Horkeliella purpurascens* Rydb. N. Am. Fl. 22:282 (1908). *P. purpurascens* var. *pinetorum* Cov. Proc. Biol. Soc. Wash. 7:77 (1892), type loc. Trout Mdws., Kern River, *Coville* 1579. *Horkelia pinetorum* Rydb. Bull. Torr. Club 25:55 (1898); Mem. Dept. Bot. Columbia Univ. 2:143, pl. 83 (1898). *Horkeliella pinetorum* Rydb. N. Am. Fl. 22:282 (1908). *Horkelia purpurascens* var. *pinetorum* Smiley, Univ. Cal. Publ. Bot. 9:241 (1921). Var. congdonis Jepson, Man. 491 (1925). *Horkelia congdonis* Rydb. Bull. Torr. Club 26:543 (1899), type loc. Casa Diablo, Mono. Co., *Congdon.* *Horkeliella congdonis* Rydb. N. Am. Fl. 22:283 (1908).

24. **P. kingii** Greene. Alkali Ivesia. Stems several, erect or ascending, 8 to 15 inches high; herbage glabrous, somewhat glaucous; leaves pinnate, the basal many, 2 to 5 inches long, their petioles 3 to 10 lines long; leaflets numerous, crowded, divided to the base into 2 to 4 segments, or those of cauline leaves often simple; segments oblong to orbicular, 1 to 3 lines long; cyme dichotomously branched; pedicels slender, 3 to 5 lines long, these and the calyx somewhat pubescent; calyx-tube shallow, 1¼ to 2 lines wide; petals white, broadly spatulate with a short claw, 2¼ to 3½ lines long; stamens 15 to 20; filaments filiform; pistils 2 to 5 (or 8).

Alkaline soil in valleys, 1000 to 6500 feet: Mono Co. East to Nevada and western Utah. June-Aug.

Loc.—Adobe Valley, se. of Mono Lake, *Duran* 1955.

Refs.—POTENTILLA KINGII Greene, Pitt. 1:105 (1887). *Ivesia kingii* Wats. Bot. King 91 (1871), "Monitor, Diamond and Ruby Valleys," Nev., *Watson* 348; Rydb. N. Am. Fl. 22:286 (1908). *Horkelia kingii* Rydb. Mem. Dept. Bot. Columbia Univ. 2:148, pl. 90, figs. 1–5 (1898). *Ivesia pallida* Greene; Rydb. N. Am. Fl. 22:286 (1908).

25. **P. campestris** Jepson. KAWEAH IVESIA. Stems ascending or spreading, 3 to 8 (or 11) inches high; herbage villous but green; leaves pinnate; basal leaves many, the blades 1 to 4 inches long and 2 to 3 lines wide, the petioles ¼ to 1 inch long; cauline leaves few and reduced; leaflets 1 to 3 lines long, 2 to 4-divided into oblanceolate divisions; cyme compact or capitate; flowers 3 to 4 lines wide; bractlets narrow, linear-lanceolate, noticeably shorter than or nearly equaling the triangular-lanceolate calyx-lobes; petals 5 (or sometimes 4), pale yellow, 2 to 2½ lines long, widely spreading, spatulate-obovate or rhomboid with conspicuous claw, the broad blade often truncate or slightly emarginate at apex; stamens 15 to 20; filaments filiform, short; achenes 5 to 10.

Gravelly soil, open pine forest or borders of alpine meadows, 7500 to 9300 feet: mountains of the upper Kings, Kaweah and Kern rivers. July-Aug.

Locs.—Williams Mdw., South Fork Kings River, *Jepson* 759; Kaweah Mdws., *Purpus* 5126; Sand Mdw., South Fork Kaweah River, *Jepson* 4676; Volcano Creek, *Jepson* 4938.

Refs.—POTENTILLA CAMPESTRIS Jepson, Man. 490, fig. 485 (1925). *P. utahensis* var. *campestris* Jones, Proc. Cal. Acad. ser. 2, 5:679 (1895), type loc. Whitney Mdws., Tulare Co., *Coville & Funston* 1624. *Ivesia utahensis* var. *campestris* Jones l.c. *Horkelia campestris* Rydb. Mem. Dept. Bot. Columbia Univ. 2:147, pl. 88, figs. 1–4 (1898). *Ivesia campestris* Rydb. N. Am. Fl. 22:285 (1908). *Horkelia mollis* Eastw. Bot. Gaz. 41:286 (1906), type loc. Hockett Mdws., Tulare Co., *Culbertson* 4405. *Ivesia mollis* Rydb. N. Am. Fl. 22:285 (1908).

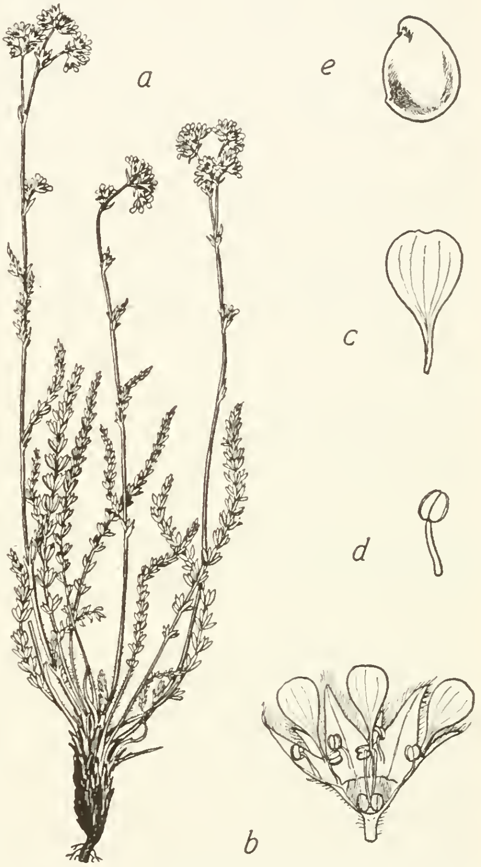

Fig. 163. POTENTILLA UNGUICULATA Greene. *a*, habit, × ½; *b*, long. sect. of fl., × 4½; *c*, petal, × 7½; *d*, stamen, × 10; *e*, achene, × 14.

26. **P. unguiculata** Greene. MEADOW IVESIA. (Fig. 163). Stems many, ascending, leafy, 5 to 15 inches high; herbage villous but green; leaves pinnate, the basal and cauline with blades 2 to 4 inches long, the petioles ¼ to ⅓ as long; leaflets crowded, 3 or 4-cleft into linear divisions, 1½ to 2½ lines long; cyme compact, sparingly branched, leafy-bracted, the clusters capitate; flowers 4 lines wide; calyx and bractlets usually purplish or rose; petals white, spatulate or obovate with rounded or truncate apex, at base drawn down to a long narrow claw, 1½ to 2 lines long; stamens 10 to 15; filaments filiform; pistils 1 to 5, usually not all maturing.

Meadows and moist slopes, 5000 to 8000 feet: Sierra Nevada from Mariposa and Fresno Cos. to Inyo Co. July-Aug.

Locs.—Westfalls Mdw., Yosemite, *Bolander* 4964; Clover Mdw., Soquel Range, Madera Co., *Kennedy;* Jackass Mdws., Madera Co., *Congdon;* Huntington Lake, *Jepson* 13,044; Vermilion Valley, Mono Creek, Fresno Co., *Jepson* 13,189; Markwood Mdws., Fresno Co., *Jepson* 16,028; Inyo Co. (Pitt. 1:103).

Refs.—POTENTILLA UNGUICULATA Greene, Pitt. 1:105 (1887); Jepson, Man. 490 (1925). *Ivesia unguiculata* Gray, Proc. Am. Acad. 7:339 (1868), type loc. Westfalls Mdw., Mariposa Co., *Bolander* 4964. *Horkelia unguiculata* Rydb. Mem. Dept. Bot. Columbia Univ. 2:146, pl. 87 (1898). *P. ciliata* Greene, Pitt. 1:103 (1887), type loc. "Owens Valley," Inyo Co., *Kellogg*.

27. **P. pickeringii** Greene. Silk Ivesia. Stems erect or spreading, ¾ to 2 feet high; herbage white silky-villous; leaves pinnate, the basal numerous, with blades 3 to 10½ inches long, the petioles about ¼ to ⅓ as long; cauline leaves 5 to 10, 1 to 2 (or 3½) inches long; leaflets numerous, at first congested and closely imbricated, 2 to 5-parted, 2 to 6 lines long, the segments oblong to oblong-elliptic; cyme freely branched, the flowers in dense or capitate terminal clusters; flowers 4 to 5½ lines wide; calyx-tube turbinate at base; petals white or yellowish, roundish-obovate, truncate or emarginate-mucronate, tapering to a narrow claw, 2 to 3 lines long, exceeding the calyx-lobes; stamens 14 to 20; filaments filiform; achenes 2 to 5.

Dry gravelly soil in valleys, 5000 to 5500 feet: Sierra Nevada (east or north side) from Nevada Co. to Siskiyou Co. Southern Oregon; western Nevada. June-Aug.

Field note.—The root-crown becomes oblong or subglobose through the continued addition of the persistent leaf bases.

Locs.—Dog Valley, Nevada Co., *Sonne;* Martis Valley, Nevada Co., *Sonne* 353; Sierra Valley, Plumas Co., *Jepson* 8034; Portola, Plumas Co., *K. Brandegee;* Edgewood, Siskiyou Co., *T. Brandegee.*

Refs.—POTENTILLA PICKERINGII Greene, Pitt. 1:105 (1887); Jepson, Man. 491, fig. 486 (1925). *Ivesia pickeringii* Torr. Phanerogamia of Pac. Coast, Wilkes Exped. 288, t. 4 (1874), type loc. Klamath River, *Pickering. Horkelia pickeringii* Rydb. Mem. Dept. Bot. Columbia Univ. 2:145, pl. 86 (1898). *H. sericoleuca* Rydb. l.c. 144, pl. 85, figs. 1–5, type loc. Sierra Co., *Lemmon* 11 (differing mainly in the more robust habit and slightly longer pedicels). *Ivesia sericoleuca* Rydb. N. Am. Fl. 22:284 (1908).

28. **P. argyrocoma** Jepson. Mountain Mouse-tail. Stems spreading, 4 to 10 inches high, villous-pubescent or glabrate; basal leaves many, the blades 1 to 2½ inches long, on petioles ½ to ¾ inch long; cauline leaves 1 or 2, the blades 1 inch long; leaflets densely silvery-silky, densely imbricated, 2 to 3-parted, the segments oblong-elliptic, 1 line long; cyme open or somewhat dense, its forks ending in subcapitate clusters; flowers 4 lines wide; calyx-tube rusty, white-hirsute within; bractlets oblong-lanceolate, half as long as the lanceolate calyx-lobes; petals white, obovate- or cuneate-spatulate, often short-clawed, 2 lines long, exceeding the calyx-lobes; stamens 20; filaments somewhat dilated; achenes 4 to 7, smooth.

Dry open or coniferous slopes, 6000 to 6900 feet: San Bernardino Mts. May-June.

Loc.—Potentilla argyrocoma is an extremely narrow endemic, having been collected only in Bear Valley of the San Bernardino Mts. (*Parish* 2362).

Refs.—POTENTILLA ARGYROCOMA Jepson, Man. 491 (Apr. 14, 1925); M. & J. Bull. S. Cal. Acad. 24:13 (May 20, 1925). *Horkelia argyrocoma* Rydb. Mem. Dept. Bot. Columbia Univ. 2:144, pl. 84 (1898), type loc. San Bernardino Mts., *Parish* 151. *Ivesia argyrocoma* Rydb. N. Am. Fl. 22:284 (1908). *I. unguiculata* Wats. Bot. Cal. 2:444 (1880), not Gray.

29. **P. santolinoides** Greene. Silver Mouse-tail. Plants ½ to 1 foot high, the stems slender, erect, nearly naked, subglabrous, diffusely branched above and forming an open panicle of cymes; leaves numerous, pinnate, the blades terete, densely silvery-villous, 1 to 2½ (or 5) inches long, the petioles 3 to 5 lines long, the minute leaflets closely imbricated and all but concealed by the pubescence; panicle large; pedicels filiform, 2 to 9 lines long; flowers 3½ to 4 lines wide; petals white, orbicular, exceeding the short calyx-lobes; stamens 14 to 16; filaments filiform; anthers didymous, purple or pale, opening by a subterminal slit or pore; pistil 1; achenes smooth or faintly sinuous-rugulose.

Sandy flats or open gravelly or rocky ridges, 5000 to 11,800 feet: Sierra Nevada from Eldorado Co. to Kern Co.; Tehachapi Mts.; mountains of the Mt. Pinos region; San Bernardino and San Jacinto mountains. June-Aug.

Tax. note.—Potentilla santolinoides, notably constant throughout its range, is an outstanding member of the subgenus Ivesia and is remarkable for its single pistil and the mode of dehiscence of the anthers. It is mainly upon these characters that it was made by Rydberg the type of his proposed genus Stellariopsis (Mem. Dept. Bot. Columbia 2:155). Reduction in the number of pistils to 3 or 2 is, however, common in the Ivesia group of Potentilla and that an extreme and constant condition has been attained in some species is not unexpected. Reduction to one achene often occurs in P. gordonii Greene and occasionally in P. unguiculata Greene. Anthers in P. santolinoides show a marked tendency toward the mode of dehiscence usually described as "opening by a pore." Over twenty flowers were examined for this character. In the majority of cases the anthers opened by a short subterminal slit; in certain specimens the slit became rounded into a definite pore. This tendency was associated with a change in anther shape, the valves becoming obovate rather than oval-elliptical. In a few specimens the anthers appeared to open by a pore with no preliminary slit observable (Kaiser Crest, Fresno Co., *A. L. Grant* 1013; Mt. Pinos, *Peirson* 3233; Huntington Lake, *Ferguson* 282). This latter condition is more usual in specimens from Southern California, while in the Sierra Nevada dehiscence by a slit is the prevailing method. It appears, then, that the characters upon which Stellariopsis was based are inconstant or unimportant, and that this group should not be segregated from the subgenus Ivesia of Potentilla.

Locs.—Myers sta., Eldorado Co., *Ottley* 932; Mt. Ralston, Eldorado Co., *H. M. Evans;* Kennedy Mdw., Relief Creek, South Fork Stanislaus River, *A. L. Grant* 906; Benson Pass, Tuolumne Co., *Jepson* 3375; Tuolumne Mdws., *Jepson* 4479; Lake Merced, Merced River, *Jepson* 3203; El Capitan, Yosemite, *Jepson* 4358; Devils Postpile, Madera Co., *A. L. Grant* 1561; Kaiser Crest, Fresno Co., *Jepson* 13,016; Kearsarge Pass, *Jepson* 880; Wildflower Lake, w. Inyo Co., *Jepson* 879; Cottonwood Creek, Inyo Co., *Jepson* 5073; Twin Lakes, Silliman Crest, *W. Fry* 363; Hockett Mdws., Tulare Co., *Culbertson* 4315. Tehachapi Mts.: Tehachapi Peak, *Dudley* 313. S. Cal mts.: Mt. Pinos; Mt. Alamos, *Hall* 6705; Holcomb Valley, San Bernardino Mts., *Parish* 1819; Tahquitz Valley, San Jacinto Mts. (Bull. S. Cal. Acad. 24:14).

Refs.—POTENTILLA SANTOLINOIDES Greene, Pitt. 1:106 (1887); Jepson, Man. 492, fig. 487 (1925). *Ivesia santolinoides* Gray, Proc. Am. Acad. 6:531 (1865), type loc. "Sierra Nevada", *Brewer,* probably his no. 1661, above Nevada Fall. *Stellariopsis santolinoides* Rydb. Mem. Dept. Bot. Columbia Univ. 2:155, pl. 95 (1898); N. Am. Fl. 22:292 (1908).

30. **P. muirii** Greene. GRANITE MOUSE-TAIL. Stems slender, naked except for a pair of reduced or minute leaves at the middle, 2 to 6 inches high, villous-pubescent; leaves pinnate, densely silvery-silky, the basal tufted, the blades ½ to 1½ (or 2½) inches long, terete with the numerous minute leaflets densely covering the axis ("mouse-tail" type) and all but concealed by the pubescence; petioles 1 to 6 lines long; cyme with 2 or 3 forks, the flowers in subcapitate clusters, or the cyme reduced to a single terminal head; flowers 1½ to 2½ lines wide; petals yellow, linear to oblanceolate-oblong, acute to obtuse, ¾ to 1¼ lines long, ½ the length of the calyx-lobes; stamens 5, the filaments minute, nearly filiform; achenes usually 2.

Gravelly or rocky alpine slopes, 9500 to 11,500 feet: Sierra Nevada from Tuolumne Co. to Inyo Co. July-Aug.

Locs.—Mt. Conness, *J. B. Lembert;* Ireland Lake, Lyell Fork Tuolumne River, *Kennedy;* Silver Pass, Fresno Co., *A. L. Grant* 1527; Evolution Basin, Fresno Co., *E. Ferguson* 489; Baker Creek, w. Inyo Co., *Duran* 1811.

Refs.—POTENTILLA MUIRII Greene, Pitt. 1:106 (1887); Jepson, Man. 492 (1925). *Ivesia muirii* Gray, Proc. Am. Acad. 8:627 (1873), type loc. Mt. Hoffmann, *Muir. Horkelia muirii* Rydb. Mem. Dept. Bot. Columbia Univ. 2:148, pl. 90, figs. 6–10 (1898). *H. chandleri* Rydb. Bull. Torr. Club 28:177 (1901), type loc. Mt. Goddard, *Hall & Chandler* 700. *Ivesia chandleri* Rydb. N. Am. Fl. 22:287 (1908).

31. **P. callida** Hall. ROCK IVESIA. Plants dwarfed, caespitose, ¾ to 2 inches high; stems subscapose, with 1 or 2 pairs of reduced leaves or stipular bracts; pubescence thinly hirsute; leaves basal, pinnate, the blades 6 to 10 lines long; petioles 1 to 4 lines long; leaflets about 13, 1 to 2 lines long, cleft to the base, the segments roundish-oval to elliptical-oblong; cymes 1 to 6-flowered; flowers 1½ to 2½ lines

wide; petals oblong-obovate, acutish at apex, ¾ to 1½ lines long; stamens 15 to 20; filaments filiform, sinuous; styles somewhat glandular-papillose; achenes about 4, smooth or faintly rugulose.

Rocky ridges, 8000 feet: Tahquitz Peak, San Jacinto Mts. Aug.

Note on relationship.—Potentilla callida, though closely related to P. shockleyi, differs in a number of details. The plants are more reduced and less glandular, the leaves and floral structures much smaller. The pubescence is finer. The calyx-tube lacks the pentagonal shape characteristic of P. shockleyi. The stamens are three to four times as many, with long sinuous filaments and anthers not one-fourth the size of those of P. shockleyi. The ranges are widely separated and no intermediate plants have been collected. P. callida is known only from one station.

Refs.—POTENTILLA CALLIDA Hall, Univ. Cal. Publ. Bot. 1:86 (1902), type loc. Tahquitz Peak, San Jacinto Mts., *Hall* 2611. *Ivesia callida* Rydb. N. Am. Fl. 22:286 (1908). *P. shockleyi* var. *callida* Jepson, Man. 492 (1925).

32. **P. shockleyi** Jepson. SKY IVESIA. Stems scapose, scarcely exceeding the foliage, usually bearing a single pair of stipular bracts, 2 to 3 inches high, these and the leaves densely tufted; herbage finely glandular-puberulent; leaves pinnate, the blades linear-oblong in outline, 1 to 2 inches long, the petioles ⅓ to ½ as long; leaflets crowded, 2 to 4-parted into obovate obtuse bristle-tipped segments, 1 to 1¼ lines long; cyme 4 or 5-flowered, distinctly racemose; calyx-tube pentagonal in fruit; flowers 2½ to 3½ lines wide, on somewhat arcuate pedicels; petals white, ovate, shorter than the calyx-lobes; stamens 5; filaments linear-subulate; achenes 3 to 5, smooth.

Rocky alpine peaks, 10,000 to 13,000 feet: eastern crests of the Sierra Nevada from Placer Co. to Mono Co.; White Mts. June-July.

Locs.—Sierra Nevada: Tinker's Knob, Placer Co., *Sonne;* Mt. Dana, *H. Sharsmith.* White Mts.: Cottonwood Creek, *Duran* 1634.

Refs.—POTENTILLA SHOCKLEYI Jepson, Man. 492 (1925). *Ivesia shockleyi* Wats. Proc. Am. Acad. 23:263 (1888), based on spms. from Silver Peak, Alpine Co., *Lemmon,* and White Mts., Mono Co., *Shockley. Horkelia shockleyi* Rydb. Mem. Dept. Bot. Columbia Univ. 2:153, pl. 93, figs. 8–14 (1898). *P. decipiens* Greene, Pitt. 1:106 (1887) excluding synonyms, type loc. Truckee, *Sonne;* not P. decipiens Jord. (1856). *P. nubigena* Greene, Erythea 3:36 (1895).

33. **P. gordonii** Greene. ALPINE IVESIA. Stems erect, nearly naked, 1 to 6 inches high, increasing in length ½ to 2 inches after anthesis; herbage minutely viscid-pubescent, or often somewhat hirsute; leaves basal, pinnate, the blades narrowly linear in outline, ½ to 3½ inches long, on petioles 2 to 10 lines long; leaflets numerous, densely set, 1 to 2½ lines long, 3 to 5-cleft nearly to the base into obovate segments; cyme more or less dense; flowers 2½ to 3 lines wide; bractlets linear or lanceolate; calyx-tube cupulate; petals yellow, 1½ lines long, at first almost orbicular, exceeding the calyx-lobes, becoming spatulate after anthesis and then shorter than the accrescent calyx-lobes; stamens 5; filaments filiform; achenes 1 to 4, smooth.

Alpine or subalpine, among rocks, 7800 to 13,000 feet: Yollo Bolly Mts.; Sierra Nevada from Tuolumne Co. to Modoc Co. North to Washington, east to Montana and Colorado. July-Aug.

Field note.—The root-crown is a thickened somewhat fleshy structure, which in some cases is subfusiform or obovate-tuberous.

Locs.—Inner North Coast Range: South Yollo Bolly, *Jepson* 14,175. Sierra Nevada: Mt. Dana, *Lemmon;* Piute Peak, Tuolumne Co., *Constance Douglas;* Sonora Peak, *A. L. Grant* 416; Ebbetts Pass, *Brewer* 2071; Castle Peak (Mt. Stanford), *Sonne* 83; Eagle Peak, Warner Mts., Modoc Co., *Jepson* 7971.

Var. **ursinorum** Jepson. Leaves grayish with a short stiff pubescence; stamens 5 (as in the next two vars.).—Montane, 6800 to 9000 feet, Salmon and Scott mountains: Bear Creek, Trinity Co., *Alexander & Kellogg* 313; Mt. Eddy, Siskiyou Co., *Alexander & Kellogg* 329.

Var. **megalopetala** Jepson. Leaf-blades ½ to 4½ inches long, sometimes terete; cymes sometimes less congested; calyx-tube in age saucer-shaped (as also in the next three vars.); bractlets oval to oblong; petals conspicuous, orbicular to obovate-spatulate, exceeding the calyx-lobes;

pistils 8 to 24.—Moist grassy banks or meadows, 7500 to 12,750 feet: Sierra Nevada from Mariposa Co. to Tulare and Mono Cos.; White Mts. June-Aug.

Locs.—Sierra Nevada: Clouds Rest, Yosemite, Mariposa Co., *Chesnut & Drew;* Vogelsang Pass, *Jepson* 4429j; Mt. Dana, *Jepson* 3290; Bloody Cañon, Mono Co., *Jepson* 4436; Gem Pass, Mono Co., *Kennedy;* East Fork Kern River, *Jepson* 5047; Volcano Mdws., Tulare Co., *Hall & Babcock* 5467; Kaweah Mdws., Tulare Co., *Purpus* 5172; Hockett Mdws., Tulare Co., *Jepson* 4681. White Mts.: Sheep Mt., *Jepson* 7324 (cauline leaves and bracts sometimes entirely wanting and leaflets bristle-tipped, representing the form called Ivesia scandularis Rydb.).

Var. **lycopodioides** Greene. Plants extremely dwarfed and much compacted, 1 to 2 inches high; herbage glabrate; flowering stems scapose with a single pair of small bracts on the lower portion; leaf-blades terete, ¼ to ½ inch long, the segments of the leaflets orbicular; heads small, 3½ lines broad; bractlets oval; pistils about 8.—Alpine, 11,000 to 12,000 feet: Mt. Dana (*Jepson* 3297). Intergrading with var. megalopetala and replacing it at very high altitudes.

Var. **chaetophora** Jepson. Lower stipules broader, the free portion dilated; leaflets narrowly oblong, usually bristle-tipped, 1½ lines long; cyme often open; bractlets linear to oblong; petals narrowly obovate; stamens 10; receptacle enlarged, conoid; pistils 11 to 15.—Alpine, 8500 to 11,000 feet: mountains about the headwaters of the Kaweah and Little Kern rivers. June-Sept.

Var. **pygmaea** Jepson. Stems erect or ascending, ½ to 4 inches high, the plants sometimes extremely dwarfed; leaf-blades terete, (½ or) ¾ to 2 inches long, the leaflets minute, orbicular or obovate, bristle-tipped; petals oblanceolate to narrowly obovate; stamens usually 10; receptacle enlarged, conoid; pistils usually 10 or 11.—Alpine, 10,000 to 13,000 feet: Sierra Nevada from Fresno Co. to Tulare Co. July-Aug. This variety intergrades with var. chaetophora.

Locs.—Evolution Basin, Fresno Co., *E. Ferguson* 477; West Vidette, South Fork Kings River, *Jepson* 824; Harrison Pass, *Jepson* 5029; Mt. Brewer, *Brewer* 2812; Mt. Whitney, *Burton & Ryerson* 21 (extremely reduced form), *Jepson* 1072; Skyparlor Mdw., Chagoopa Plateau, *Jepson* 5010; Farewell Gap, *Purpus* 5178.

Refs.—POTENTILLA GORDONII Greene, Pitt. 1:106 (1887); Jepson, Man. 492, fig. 488 (1925). *Horkelia gordonii* Hook. Jour. Bot. 5:341, pl. 12 (1853), type loc. upper Platte River, *Gordon;* Rydb. Mem. Dept. Bot. Columbia Univ. 2:151, pl. 92, figs. 7–11 (1898), N. Am. Fl. 22:289 (1925). *Ivesia gordonii* T. & G. Pac. R. Rep. 6:72 (1857). *I. alpicola* Rydb.; Howell, Fl. Nw. Am. 1:182 (1898), type loc. Mt. Adams, Wash. *Horkelia gordonii* var. *alpicola* Rydb. Mem. Dept. Bot. Columbia Univ. l.c. 152. Var. URSINORUM Jepson, Man. 492 (1925), type loc. Bear Creek, Salmon Mts., n. Trinity Co., *Alexander & Kellogg* 313. Var. MEGALOPETALA Jepson, Man. 492 (1925). *Horkelia gordonii* var. *megalopetala* Rydb. Mem. Dept. Bot. Columbia Univ. 2:152 (1898), type loc. Mt. Dana, *Bolander. Ivesia megalopetala* Rydb. N. Am. Fl. 22:289 (1908). *P. gordonii* var. *scandularis* Jepson, Man. 492 (1925). *Horkelia scandularis* Rydb. Mem. Dept. Bot. Columbia Univ. 2:150, pl. 91, figs. 5–9 (1898), type loc. White Mts., *Shockley* 572. *Ivesia scandularis* Rydb. N. Am. Fl. 22:288 (1908). Var. LYCOPODIOIDES Greene, Pitt. 1:106 (1887); Jepson, Man. 492 (1925). *Ivesia lycopodioides* Gray, Proc. Am. Acad. 6:530 (1865), type loc. Mt. Dana; Rydb. N. Am. Fl. 22:288 (1908). *I. gordonii* var. *lycopodioides* Wats.; B. & W. Bot. Cal. 1:183 (1876). *Horkelia lycopodioides* Rydb. Mem. Dept. Bot. Columbia Univ. 2:151, pl. 92, figs. 1–6 (1898). Var. CHAETOPHORA Jepson, Man. 492 (1925). *Horkelia chaetophora* Rydb. Bull. Torr. Club 26:543 (1899), type loc. Farewell Gap, Tulare Co., *Purpus* 1409. *Ivesia chaetophora* Rydb. N. Am. Fl. 22:290 (1908). Var. PYGMAEA Jepson, Man. 492 (1925). *Ivesia pygmaea* Gray, Proc. Am. Acad. 6:531 (1865), type loc. "Sierra Nevada", *Brewer;* Rydb. N. Am. Fl. 22:289 (1908). *I. gordonii* var. *pygmaea* Wats.; B. & W. Bot. Cal. 1:183 (1876) in part. *Horkelia pygmaea* Rydb. Mem. Dept. Bot. Columbia Univ. 2:152, pl. 93, figs. 1–7 (1898) in part.

34. **P. webberi** Greene. WIRE IVESIA. Stems reddish, slender or wiry, 2 to 4½ inches high, naked save for a pair of leaves at or above the middle; petioles and stems pilose, the leaflets hirsute; leaves pinnate, the basal with blades ¾ to 2¾ inches long; petioles ¾ to 1¾ inches long; leaflets 8 to 10, 2½ to 4 lines long, approximate, 2 to 5-divided into linear acute segments; cyme capitate or subcapitate, leafy-bracted; flowers 3 to 3½ lines wide; calyx-tube densely white-hirsute within; petals yellow, oblanceolate, acute, shorter than calyx-lobes; stamens 5; filaments linear-subulate; achenes 3 or 4.

Montane, 5000 feet: Sierra and Plumas Cos. May.

Geog. note.—A highly restricted endemic, Potentilla webberi has been recorded only from the neighboring Indian and Sierra valleys in Plumas and Sierra counties.

Refs.—POTENTILLA WEBBERI Greene, Pitt. 1:105 (1887); Jepson, Man. 493 (1925). *Ivesia webberi* Gray, Proc. Am. Acad. 10:71 (1874), type loc. Sierra and Indian Valleys, *Webber. Horkelia webberi* Rydb. Mem. Dept. Bot. Columbia Univ. 2:149, pl. 88, figs. 5–9 (1898).

VII. Subgenus **Horkelia.** Leaves pinnate, the leaflets usually many, ½ to 1¾ inches long, or often ⅙ to ½ inch long; calyx-tube mostly cupulate or campanulate; petals white, rarely pinkish or yellowish; stamens 10, alternately long and short; filaments dilated, at least the alternate (except one species); styles terminal or nearly so; pistils numerous, or often only 2 to 15.

35. **P. californica** Greene. California Honey-dew. Stems stoutish, erect, rather leafy, 1 to 3 feet high; herbage pubescent and more or less glandular; leaves pinnate, the basal 3 to 7 (or 15) inches long; cauline leaves mostly shorter than the basal; petioles 1 to 4 inches long, or the basal to 8½ inches long; leaflets 9 to 21 (or the upper leaves with fewer leaflets), thickish, cuneate-obovate to orbicular or oblong, more or less doubly incised or toothed above the base, ½ to 1¾ inches long; cyme openly 2 to 4-forked, the branches ending in dense few-flowered clusters and often with solitary flowers in the forks, or sometimes the whole inflorescence capitately congested; flowers 4 to 6 lines wide; calyx-tube cup-shaped, truncatish at base, rusty or purplish, 3 to 5½ lines wide; bractlets commonly exceeding the calyx-lobes, 3-toothed, or variably incised, or sometimes entire; petals oblong or spatulate, commonly erect, about 3 lines long; stamens 10, the filaments opposite the calyx-lobes subulate, the others filiform or nearly so; achenes many.

Wooded slopes or edges of brushy thickets, 5 to 600 feet: Coast Ranges from Humboldt Co. to Monterey Co. May-June.

Locs.—Blue Lake, Humboldt Co., *Tracy* 3526; Ft. Bragg, *W. C. Mathews* 69; Hopland, *Jepson* 9289; Bodega, *Crum* 753; Pt. Reyes, *Jepson* 1169; Silver Spr., Mt. Diablo, *M. Bowerman* 1666; Berkeley, *Jepson* 108p; Mt. Davidson, San Francisco, *Jepson* 10,580; Niles, Alameda Co., *Jepson* 118p (varying towards var. frondosa Jepson); betw. Salada and Mussel Rock, San Mateo Co., *Newlon* 250; Carmel River, near Carmel, *Jepson* 111p.

Note on variation.—Occupying a well-defined range along the coast, Potentilla californica is replaced by the more delicate P. elata at higher altitudes and by P. lindleyi near the coast at the southern limit of its range. It is not known in the inner Coast Range except on Mt. Diablo. Near the ocean in exposed situations the species is often very densely glandular with thickish leaves; in the shade or inland, usually less glandular and with thinner often more deeply divided leaflets. Its most distinctive characters are the robust habit, the doubly incised leaflets, the large-bracteate few-flowered cymes, the long toothed bractlets, and the large truncate-based calyx-tube which contrasts in color with the sepals. Usually the filaments opposite the calyx-lobes are broader than those alternate, but in some plants this difference is not striking. Occasionally, plants collected near the coast (Pt. Reyes, *Jepson* 1169) have all filaments nearly equally dilated. The bractlets, typically 3-toothed and exceeding the calyx-lobes, are sometimes entire and of about the same length as the calyx-lobes. The petals usually equal the calyx-lobes (not exceeding them as in P. lindleyi and many other species of the subgenus Horkelia), but here also is considerable variation. Var. frondosa Jepson appears to occur only occasionally within the range of the species. Superficially it bears a resemblance to P. glandulosa Lindl. and, as indicated by leaves and inflorescence, is undoubtedly the most primitive Horkelia within our territory. Since so rarely collected one is tempted to consider the form a retrogressive mutation. Intermediates connecting it with the species are uncommon (Crockett, Contra Costa Co., *Tidestrom*).

Var. **frondosa** Jepson. Leaflets 5 to 9, oblong or oval, toothed or shallowly doubly incised; calyx-tube usually narrower, 2½ to 3 lines wide; petals usually shorter than the sepals, 1½ to 2 lines long.—Sandy or gravelly slopes, 20 to 1500 feet: Contra Costa and Alameda Cos.; Monterey Co.

Locs.—Martinez; Sunol, Alameda Co., *Mason;* Pt. Pinos, Monterey Co., *Michener & Bioletti;* Jolon grade, Monterey Co., *Hall* 9969 (less glandular; leaves thin, glabrate).

Refs.—Potentilla californica Greene, Pitt. 1:100 (1887); Jepson, Fl. W. Mid. Cal. 282 (1901), ed. 2, 209 (1911), Man. 494 (1925). *Horkelia californica* C. & S. Linnaea 2:26 (1827), type loc. San Francisco, *Chamisso;* Rydb. Mem. Dept. Bot. Columbia Univ. 2:126, pl. 57 (1898). *Sibbaldia californica* Spreng. Syst. 4^2:341 (1827). *Horkelia grandis* H. & A. Bot. Beech. 339 (1838), type from Cal., *Douglas*. *P. californica* var. *carmeliana* Jepson, Fl. W. Mid. Cal. 282 (1901), ed. 2, 209 (1911), type loc. Carmel River, *Jepson* 111p. Var. frondosa Jepson, Man. 494 (1925). *P. frondosa* Greene, Pitt. 1:300 (1889), type loc. Martinez, Contra Costa Co., *Greene*. *Horkelia frondosa* Rydb. Bull. Torr. Club 25:54 (1898); Mem. Dept. Bot. Columbia Univ. 2:125, pl. 56 (1898).

36. **P. elata** Greene. Mountain Honey-dew. Stems erect, 1½ to 2 feet high; herbage glandular, pilose-pubescent; leaves pinnate, the basal with blades 3 to

7½ inches long, on petioles ½ to as long; leaflets 15 to 19, thin, cuneate-obovate, once or twice incisely cleft, 4 to 9 lines long; cyme dichotomously forked, the flowers solitary or in 3s, 5 lines wide; calyx-tube cup-shaped, 1 to 1½ or in fruit 2½ lines wide; bractlets lanceolate, entire or often 2 or 3-toothed, equaling or exceeding the calyx-lobes; calyx-lobes 1½ to 2 lines long; petals white, oblong-oblanceolate or oblanceolate, truncatish at apex, 2 to 3 lines long, commonly erect; stamens 10, 5 short with filiform filaments, the 5 opposite the calyx-lobes with filaments deltoid-dilated at base; achenes many, smooth or finely striate.

Moist shady slopes, 2000 to 5000 feet: North Coast Ranges from Humboldt Co. to Napa Co.; Sierra Nevada from Amador Co. to Fresno Co. May-June.

Note on relationship.—Potentilla elata Greene is the high altitude and interior aspect of P. californica Greene, so nearly related that its specific status is questionable. The most reliable diagnostic characters are apparently the more delicate habit, less glandular condition, more finely dissected leaflets and smaller calyx-tube. Some forms approach P. californica very closely and are difficult to refer to one species or the other. The form described as Horkelia glandulosa Eastw. is intermediate toward P. californica with respect to its stouter habit and more glandular condition.

Locs.—North Coast Ranges: Grouse Creek, Humboldt Co., *Chesnut & Drew;* North Fork Middle Eel River, near Foster Glades, se. Trinity Co., *Jepson* 104p; Comptche, Mendocino Co., *H. A. Walker* 288; Tunis Mill, Elk Mt., n. Lake Co., *Jepson* 123p; La Jota plateau, Howell Mt., *Jepson;* Angwin's Mdw., Howell Mt., *Jepson* 124p (more robust, approaching P. californica). Sierra Nevada: Volcano, Amador Co., *Hansen* 264; Confidence, Tuolumne Co. (more robust, approaching P. californica); Pine Ridge, Fresno Co., *Crum* 1286.

Var. dissita Crum var. n. Herbage more conspicuously hirsute-pubescent.—(Herbae dense hirsuto-pubescentes.)—Lagrange, Stanislaus Co., *Jepson* 109p (type); Bower Cave, Mariposa Co., *Jepson* 110p.

Refs.—POTENTILLA ELATA Greene, Pitt. 1:100 (1887), type loc. shady banks of upper Napa River above Calistoga, *Greene;* Jepson, Fl. W. Mid. Cal. 283 (1901), ed. 2, 209 (1911), Man. 495 (1925). *Horkelia californica* B. & W. Bot. Cal. 1:181 (1876) in part. *P. californica* var. *elata* Greene, Fl. Fr. 66 (1891). *Horkelia elata* Rydb. Bull. Torr. Club 25:54 (1898); Mem. Dept. Bot. Columbia Univ. 2:127, pl. 58 (1898). *H. glandulosa* Eastw. Bull. Torr. Club 32:195 (1905), type loc. Laytonville, Mendocino Co., *Eastwood* (plant stoutish, glandular, leaflets about 11), (vidi typ.). Var. DISSITA Crum.

37. **P. truncata** Jepson. RAMONA HONEY-DEW. Stems few, erect, 8 to 20 inches high; herbage hirsute and glandular; leaves pinnate, mostly basal, the blades 1½ to 3 inches long; petioles ½ to 1 inch long; leaflets 5 to 9, obovate-cuneate, truncate at apex, finely dentate, more coarsely and deeply toothed at the apex, 4 to 10 lines long, the terminal larger; cymes few-flowered; calyx-tube shallow, saucer-shaped, 2½ lines wide; petals white, orbicular, short-clawed, 2½ to 3 lines long; filaments opposite the calyx-lobes ovate-triangular, ½ line long, the alternate ones broadly oblong, ¼ line long; achenes many.

Central San Diego Co. South to Lower California. May-June. Rarely collected.

Locs.—Ramona, *Chandler* 5321; Mesa Grande (Bull. S. Cal. Acad. 24:12). L. Cal.: Guadalupe Mts. (Bull. S. Cal. Acad. 24:12).

Refs.—POTENTILLA TRUNCATA Jepson, Man. 495 (Apr. 14, 1925); M. & J. Bull. S. Cal. Acad. 24:12 (May 20, 1925). *Horkelia truncata* Rydb. N. Am. Fl. 22:274 (1908), based on a transplant from Ramona, San Diego Co., *Chandler* 5321. *H. californica* var. *paucifoliolata* Wats.; Rydb. Mem. Dept. Bot. Columbia Univ. 2:131 (1898) as synonym.

38. **P. lindleyi** Greene. MONTEREY HONEY-DEW. Stems erect or ascending, many from the root-crown, 7 to 20 inches high; herbage pubescent, more or less glandular; leaves pinnate, mostly basal, the blades 3 to 3½ inches long, the petioles 1 (to 2) inches long; leaflets 13 to 25, roundish to cuneate-obovate, sharply toothed above the base, 4 to 7 lines long; cymes corymbose, rather dense or capitately congested, many-flowered; flowers 3½ to 4½ lines wide; calyx-tube shallow, 1½ to 2 lines wide, ¾ to 1 line high; bractlets ovate, smaller than the calyx-lobes; petals white, oblong-oblanceolate, obtuse, 2½ to 3 lines long; stamens 10, the filaments

subulate-dilated, those opposite the calyx-lobes wider; achenes smooth or minutely embossed.

Sandy flats, 5 to 200 feet: along the coast from San Mateo Co. to Monterey Co. and (in less typical form) to Santa Barbara Co. Apr.-June.

Locs.—Colma, San Mateo Co., *Elmer* 5036; Corallitos, Santa Cruz Co., *Jepson* 105p; Pacific Grove, *Elmer* 4389. The following spms. are intermediate toward the variety puberula Jepson: Monterey, *Jepson* 9763b, 5705 (very glandular, cyme much branched, the flowers not capitately congested); Arroyo Grande, *Alice King;* Bicknell sta., Santa Barbara Co., *Jepson* 12,680; Surf, Santa Barbara Co., *K. Brandegee.* The following spms. vary towards P. kelloggii Greene: Corallitos, Santa Cruz Co., *Jepson* 112p; Pescadero, San Mateo Co., *Crum* 710.

Geog. note.—No sharp distinctions segregate Potentilla lindleyi from its southern phase, the var. puberula of Southern California. Plants from San Luis Obispo and Santa Barbara counties are often intermediate as to height and congestion of inflorescence. Plants corresponding most closely to the original description occur at Monterey and Pacific Grove, where Douglas might well have made the type collection. North of this region P. lindleyi apparently intergrades with P. kelloggii. Plants in exposed situations near the sea are very strongly aromatic. In such plants the stems are stout, erect, or sometimes prostrate (Pacific Grove, *Crum* 1409). The calyx-tube is usually rust-color.

Var. **puberula** Jepson. Stems few, erect, 9 to 24 inches high; cymes more open-paniculate; filaments usually very broadly subulate-dilated.—Open slopes, sandy or gravelly soil, 150 to 1500 feet: San Luis Obispo Co. to San Diego Co. Apr.-July.

Locs.—Price Cañon, San Luis Obispo, *K. Brandegee;* Purisima Hills, n. Santa Barbara Co., *Jepson* 11,945 (cymes many-flowered, open-paniculate); San Marcos grade, Santa Inez Mts., *Jepson* 12,143 (less pubescent and glandular); Ojai Valley, *Hubby;* Eaton Cañon, San Gabriel Mts., *Peirson* 362; Colton, San Bernardino Valley, *Parish* 2006; Pala, San Diego Co., *Munz* 10,366; Carlsbad, w. San Diego Co., *Parish* 4474; Mesa Grande, San Diego Co., *E. Ferguson* 105.

Var. **lepida** Crum var. n. Stems slender, erect or decumbent-ascending; herbage less glandular; leaflets thinner, more remote; calyx-tube smaller, 1½ to 1¾ lines wide, ⅔ to ¾ line high; petals narrowly oblong-lanceolate, white or pinkish.—(Caules graciles, erecti vel decumbente-ascendentes; herbae minus glandulosae; foliola tenuiora, remotiora; tuba calycis parvior, lin. 1½–1¾ latum, lin. ⅔–¾ altum; petala anguste oblongo-lanceolata, alba vel pallido-punicea.)—Sandy soil under pines, 100 feet: Pacific Grove, *Crum* 1408 (type).

Refs.—POTENTILLA LINDLEYI Greene, Pitt. 1:101 (1887); Jepson, Man. 495 (1925). *Horkelia cuneata* Lindl. Bot. Reg. sub t. 1997 (1837), type from Cal., *Douglas;* Rydb. Mem. Dept. Bot. Columbia Univ. 2:132, pl. 66 (1898). *H. douglasiana* Nutt.; H. & A. Bot. Beech. 338 (1838) as synonym. *P. californica* var. *cuneata* Gray, Proc. Am. Acad. 6:529 (1865). *P. cuneata* Baill. Hist. Pl. 1:369 (1866); M. & J. Bull. S. Cal. Acad. 24:9 (1925); not P. cuneata Wallich (1828). *Horkelia californica* B. & W. Bot. Cal. 1:181 (1876) in part. *P. multijuga* Greene, Fl. Fr. 66 (1891); Jepson, Fl. W. Mid. Cal. 282 (1901), ed. 2, 209 (1911); not P. multijuga Lehm. (1849). Var. PUBERULA Jepson, Man. 495 (1925). *P. puberula* Greene, Pitt. 1:102 (1887), type loc. mesas near San Bernardino, *S. B. Parish* 279. *Horkelia puberula* Rydb. Bull. Torr. Club 25:55 (1898). *H. platycalyx* Rydb. Mem. Dept. Bot. Columbia Univ. 2:131, pl. 64 (1898), type loc. Santa Barbara, *W. E. Wheelock.* Var. LEPIDA Crum.

39. **P. kelloggii** Greene. COAST HONEY-DEW. Stems stout, erect, 1 to 2 feet high; herbage subsilky, or often velvety, aromatic, obscurely glandular; leaves many, pinnate, the blades 4 to 9 inches long; petioles 1 to 4½ inches long; leaflets 11 to 17, obovate, cuneate at base (or the distal often obcuneate-oblong), 6 to 12 lines long, many-toothed above the base, the teeth ovate or oblong-ovate, not deeply incised; cymes dichotomously branched, the flower clusters usually congested; flowers white, 6 to 7 lines wide; calyx-tube saucer-shaped, 2½ to 3 lines wide, 1 to 1¼ lines high; petals oblanceolate, 3 lines long; filaments subulate-dilated, those opposite petals shorter; pistils many; achenes smooth.

Sandy flats, 5 to 100 feet: along the coast from Marin and Alameda Cos. to Monterey Co. Apr.-Aug.

Field note.—Potentilla kelloggii in typical form has been collected at few localities. The dense silky pubescence distinguishes it from P. lindleyi, and this character, together with the shallow calyx-tube and congested inflorescence, from P. californica, with which it was first associated. Although Greene's observations are at variance (Pitt. 1:102), it seems certain that living plants exhale the characteristic Horkelia aroma (Alameda, *Kellogg*, field note) as well as dried ones. Living plants of the var. marinensis are markedly aromatic.

Locs.—Pt. Reyes, Marin Co., *Davy* 6710a; Oakland, *Holder* 2582; Alameda, *Greene;* Lake Merced, San Francisco, *K. Brandegee;* Pacific Grove, *Tidestrom;* Carmel Mission, *Jepson* 106p (less pubescent, more glandular, varying toward P. lindleyi).

Var. **marinensis** Jepson. Plants 4 to 12 inches high; herbage more coarsely and densely shaggy-villous; leaves mostly basal, 1¼ to 2½ inches long, usually very short-petioled; leaflets cuneate or cuneate-obovate, mostly palmately 3 to 7-toothed; inflorescence capitately congested. —Sand flats or sand dunes along the coast from Mendocino Co. to Marin Co. June-Aug.

Locs.—Ft. Bragg, *O. H. Seaholm;* Pt. Reyes, *Jepson* 8317, *Davy* 6710b (foliage and inflorescence less congested, intermediate toward the species).

Refs.—POTENTILLA KELLOGGII Greene, Pitt. 1:101 (1887); Jepson, Fl. W. Mid. Cal. 283 (1901), ed. 2, 209 (1911), Man. 496 (1925). *Horkelia californica* var. *sericea* Gray, Proc. Am. Acad. 6:529 (1865), type loc. Oakland, probably *Holder* 2582. *P. californica* var. *sericea* K. Bdg. Zoe 2:349 (1892). *Horkelia kelloggii* Greene, Bull. Cal. Acad. 2:416 (1887). *H. sericea* Rydb. Bull. Torr. Club 25:56 (1898); Mem. Dept. Bot. Columbia Univ. 2:128, pl. 60 (1898); not P. sericea L. (1753). Var. MARINENSIS Jepson, Man. 496 (1925). *Horkelia bolanderi* var. *marinensis* Elmer, Bot. Gaz. 41:321 (1906), type loc. Pt. Reyes, Marin Co., *Elmer* 5039 (vidi typ.). *H. bolanderi* Gray; Rydb. N. Am. Fl. 22:274 (1908) in part.

40. **P. bolanderi** Greene. BORDER HONEY-DEW. Stems spreading or ascending, very sparingly leafy, 2 to 12 inches high, the decumbent bases and basal leaves forming a rough but dense mat; stems thinly hirsute-puberulent and the leaves white with a densely hirsute-tomentulose covering; leaves pinnate, the blades 1 to 2 inches long; petioles ¼ to ¾ inch long; leaflets (11 or) 15 to 27, cuneate-obovate, 2 to 4 lines long, toothed or cleft at apex, the teeth acute; cyme open or dense; flowers 3 to 4½ lines wide; calyx-tube campanulate, 1 to 1½ lines wide (1¾ lines in fruit), ½ line high; petals oblanceolate to oblong-spatulate, rounded and emarginate, or acute, 2 to 2½ lines long; stamens 10; filaments lanceolate-dilated, those opposite petals slightly shorter and narrower; pistils 14 to 16; achenes many, minutely embossed.

Borders of pine forests, 2000 to 3000 feet: mountains of Lake Co. July.

Locs.—Cobb Mt., *Crum* 1397; Boggs Lake, *K. Brandegee;* Mt. Hanna, *Jepson* 116p; Mt. Konocti, *Jepson* 115p.

Var. **rydbergii** Jepson comb. n. Pubescence more dense, the hairs longer, coarser; leaves usually densely congested, the blades 1¼ to 2½ inches long; petioles ¼ to ½ inch long; calyx-tube 1½ to 2½ lines wide, ¾ line high; pistils 35 to 39.—Dry gravelly flats, 5300 to 6500 feet, Mt. Pinos region: Cuddy Valley, *Hall* 6353; Frazier Mt., *Hall* 6610. June-July.

Var. **bernardina** Jepson. Plants robust and open in habit, usually 1 to 1½ feet high (in reduced forms 4 to 8 inches high); herbage usually less pubescent, more glandular; leaf-blades 3 to 8 inches long; petioles ½ to 3 inches long; leaflets 15 to 19, usually more broadly cuneate, 5 to 7-toothed or-incised at apex, 2 to 7 lines long; calyx-tube often 2½ lines wide; petals obovate-oblong, cuneate at base; pistils about 30.—Meadow or spring borders, often shaded by pines, 4000 to 9000 feet: San Gabriel and San Bernardino mountains. June-Aug.

Locs.—San Gabriel Mts.: Pine Flats, *Peirson* 2448; Big Pines, *Peirson* 4026. San Bernardino Mts.: Glen Martin, *R. J. Smith;* Seeley Flat, *Parish* 2368; High Creek, *Peirson* 3976; Bear Lake, *J. T. Howell* 2724; South Fork Santa Ana River, *Peirson* 3286.

Var. **clevelandii** Jepson. Similar to var. bernardina; plants usually robust, 1 to 2 feet high; herbage sparsely pubescent to silky, often glandular; leaflets suborbicular or cuneate-fanshaped, typically broader than long, 5 to 9-toothed or -incised, the segments rounded at apex; filaments triangular-lanceolate; pistils 15 to 25; styles glandular-dilated at base; achenes smooth or obscurely striate.—Grassy slopes or by springs, 4200 to 7500 feet: San Jacinto Mts. to the Cuyamaca Mts. South to Lower California. May-Aug.

Locs.—San Jacinto Mts.: Strawberry Valley, *J. T. Howell* 2913 (intermediate toward var. bernardina); Tahquitz Valley, *Jepson* 2296. San Diego Co.: Palomar Mt., *Jepson* 1498; Cuyamaca Lake, *Abrams* 3922; Noble Mine, *Chandler* 5490; Laguna, e. San Diego Co., *Cleveland.*

Refs.—POTENTILLA BOLANDERI Greene, Pitt. 1:103 (1887); Jepson, Fl. W. Mid. Cal. 283 (1901), ed. 2, 210 (1911), Man. 495 (1925). *Horkelia bolanderi* Gray, Proc. Am. Acad. 7:338 (1868), type loc. Clear Lake, *Bolander* 2655; Rydb. Mem. Dept. Bot. Columbia Univ. 2:130, pl. 63 (1898). Var. RYDBERGII Jepson. *H. rydbergii* Elmer, Bot. Gaz. 39:50 (1905), type loc. Griffin, Ventura Co., *Elmer* 3971. Var. BERNARDINA Jepson, Man. 495 (1925). *Horkelia bolanderi* var. *parryi* Wats.; B. & W. Bot. Cal. 1:182 (1876), type loc. San Bernardino Mts., *Parry. H. parryi* Rydb. Mem. Dept. Bot. Columbia Univ. 2:129, pl. 62 (1898); not H. parryi Greene (1887). *H. bernardina* Rydb. N. Am. Fl. 22:273 (1908). *P. bolanderi* var. *parryi* M. & J. Bull. S. Cal.

Acad. 24:11 (1925). Var. CLEVELANDII Jepson, Man. 495 (1925); M. & J. l.c., 24:12 (1925). *P. clevelandii* Greene, Pitt. 1:102 (1887), type loc. Laguna, e. San Diego Co., *Cleveland. Horkelia clevelandii* Rydb. Bull. Torr. Club 25:54 (1898); Mem. Dept. Bot. Columbia Univ. 2:129, pl. 61 (1898). *H. californica* Bdg. Zoe 4:204 (1893).

41. **P. stenoloba** Greene. SONOMA HONEY-DEW. (Fig. 164.) Stems ascending or erect, 5 to 12 (or 15) inches high; herbage villous but more or less green, glandular-aromatic; leaves pinnate, the basal with blades 1¼ to 7 inches long; petioles ½ to 2½ inches long; leaflets 17 to 31, cuneate-obovate, 2 to 4 lines long, cleft ½ to ⅔ the way into about 4 linear lobes; cymes compact, the clusters subcapitate on the ends of the branches; flowers 3 to 3½ lines wide; calyx-tube shallow, truncate at base, 1 to 1½ lines wide, ⅓ to ¾ line high; calyx-lobes linear; petals white, cuneate or oblanceolate, emarginate, 1¾ to 2½ lines long; stamens 10; filaments dilated (triangular- to narrow-lanceolate); achenes many, smooth or nearly so.

Sandy soil of valleys or ridges, 150 to 2000 feet: Coast Ranges in Sonoma Co., Marin Co. and San Luis Obispo Co. Apr.-June.

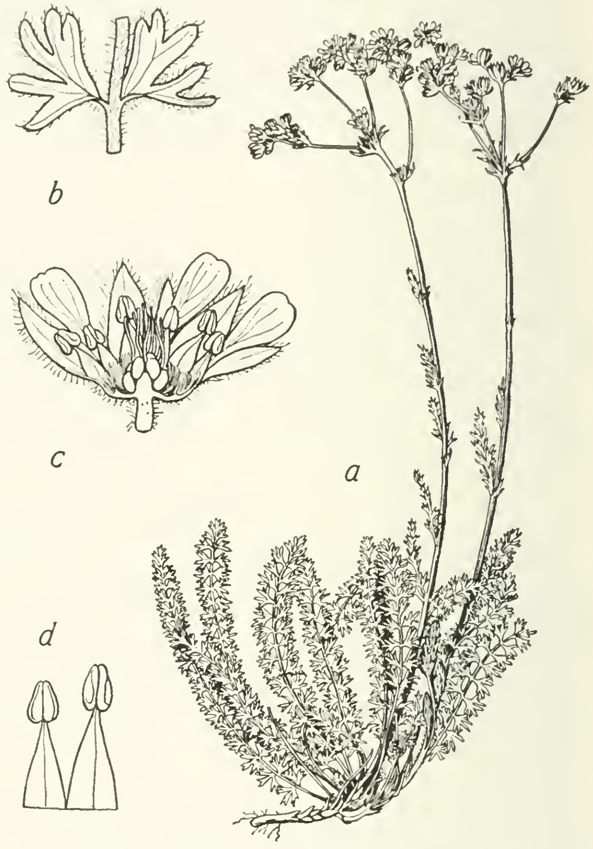

Fig. 164. POTENTILLA STENOLOBA Greene. *a*, habit, × ½; *b*, pair of leaflets, × 2¼; *c*, long. sect. of fl., × 5; *d*, stamens, × 10.

Geog. note.—Potentilla stenoloba Greene occurs apparently in only a few scattered localities. The type of Potentilla micheneri Greene, a form at somewhat higher altitude, has crowded leaflets, thus approaching rather closely the condition in the subgenus Ivesia. Other collections of this form from the same locality (Mt. Tamalpais, *Michener & Bioletti*) show much less reduction of leaflets and differ mainly from typical P. stenoloba in the somewhat broader bractlets and the shorter leaflet-segments, characters too slight to serve as the basis of a variety. The collection from near Sebastopol (*Crum* 1091) was taken from a colony growing in dry sandy soil. Although this species has at times been described as non-glandular, the Sebastopol plants were markedly glandular, exhaling the very characteristic Horkelia odor. The root-crown in this species develops heavy horizontal branches resembling rootstocks. From these structures arise stolons 6 to 14 inches long.

Locs.—Laguna, near Forestville, Sonoma Co., *M. S. Baker* 3005c; Sebastopol, Sonoma Co., *Crum* 1091; Mt. Tamalpais, *K. Brandegee;* San Luis Obispo, *Curran.*

Refs.—POTENTILLA STENOLOBA Greene, Erythea 3:36 (1895). *Horkelia fusca* var. *tenuiloba* Torr. Pac. R. Rep. 4:84 (1857), type loc. laguna of Santa Rosa Creek, *Bigelow. H. tenuiloba* Gray, Proc. Am. Acad. 6:529 (1865). *P. tenuiloba* Greene, Pitt. 1:105 (1887); Jepson, Fl. W. Mid. Cal. 283 (1901), ed. 2, 209 (1911), Man. 493 (1925), not P. tenuiloba Jord. (1852). *P. micheneri* Greene, Erythea 1:5 (1893), type loc. Mt. Tamalpais, *Michener. Horkelia micheneri* Rydb. Bull. Torr. Club 25:54 (1898); Mem. Dept. Bot. Columbia Univ. 2:127, pl. 59 (1898) in part. *P. tenuiloba* var. *micheneri* Jepson, Fl. W. Mid. Cal. 283 (1901), ed. 2, 210 (1911).

42. **P. hispidula** Jepson. Alpine Honey-dew. Stems slender, erect, 6 to 10 inches high; herbage hispid and glandular-pubescent; leaves pinnate, the basal with blades ½ to 4 inches long; petioles nearly half as long; cauline leaves few, ½ to ¾ inch long; leaflets 16 to 21, fan-shaped or broadly cuneate, divided about half way into 4 or 5 oblong or elliptic lobes, markedly hispid, especially at the tips, 2 to 3 lines long; cyme a little lax, ¾ to 1¾ inches wide, somewhat few-flowered; flowers 4 to 6 lines wide; calyx-tube bowl-shaped, 1½ to 1¾ lines wide; petals white, cuneate-obovate, emarginate to rounded at apex, rotately spreading, 2 to 2½ lines long, exceeding the calyx-lobes; stamens 10; filaments white, lanceolate or oblong-lanceolate, those opposite petals ⅓ shorter; achenes 12 to 18, apparently smooth.

Alpine pine slopes and meadows, 10,000 to 10,500 feet: White Mts. (Mono and Inyo Cos.) July-Aug.

Geog. note.—Potentilla hispidula is an extremely narrow endemic limited to the White Mts. with only one recorded definite locality (Silver Cañon near Big Prospector Mdw., *Jepson* 7347). The resemblance between this species and P. stenoloba (and its so-called variety micheneri) is rather close. There is, however, a profound climatic and topographic difference between the habitat of P. hispidula in the desert range of the White Mts. and the habitat of P. stenoloba (*P. micheneri*) on the fog-drenched Mt. Tamalpais of the Pacific coast line.

Refs.—Potentilla hispidula Jepson, Man. 493 (1925). *Horkelia hispidula* Rydb. N. Am. Fl. 22:278 (1908), type loc. White Mts., Mono Co., *W. H. Shockley* 596. *H. micheneri* Rydb. Mem. Dept. Bot. Columbia Univ. 2:127 (1898) in part.

43. **P. daucifolia** Greene. Yellow Honey-dew. Stems erect or ascending, rather rigid, 6 to 14 inches high; herbage (especially the leaves) villous; leaves pinnate, the basal with blades 2 to 5 inches long; petioles ½ to 3 inches long; leaflets 11 to 17, 3 to 8 lines long, 2-parted, the segments 2 or 3-cleft into linear divergent lobes; stipules 2 to 3 times divided into filiform segments, long-pilose, forming a conspicuous hairy tuft on the root-crown below the erect leaf-blades; cyme rather compact or even capitately congested; flowers 5 to 7 lines wide; calyx-tube saucer-shaped, 1¾ to 2 lines wide; petals cream-color, spatulate-orbicular or -obovate, truncatish or obtuse, 2 to 3½ lines long, slightly exceeding the calyx-lobes; stamens 10; filaments petaloid-dilated, those opposite the calyx-lobes deltoid; achenes 5 to 12, smooth.

Rocky slopes and ridges, 2700 to 4000 feet: Trinity Co. to Siskiyou Co. North to Oregon. Apr.-June.

Locs.—Trinity Co.: Stuart Fork, *H. S. Yates* 366. Siskiyou Co.: Edgewood, *Lemmon;* Goosenest foothills, *Butler* 1634; Shasta Valley, *Butler* 713; Quartz Valley divide, *Butler* 603; Ager, *K. Brandegee.*

Tax. note.—Potentilla daucifolia is a well-marked species. Of named segregates Horkelia pulchra Rydb. is too near the ordinary form of P. daucifolia for recognition even as a variety. The lesser depth of leaflet incision as described by Rydberg is not striking in the type specimen (Mt. Shasta, *Parry,* Herb. N. Y. Bot. Gard.), since these leaflets, 5 to 7 lines long, are cleft to within 1½ or 2 lines of the midrib. *Alexander & Kellogg* 109a (Mayten, Siskiyou Co.) is a good match for the type of H. pulchra as to leaflets, while 109b and c are about as usual in P. daucifolia. No California specimens with hirsute pubescence (the form Horkelia hirsuta Lindl.) are known to us. Rydberg described Horkelia caruifolia as not at all glandular, but the Ashland, Ore., specimens (*Howell* 1129 and *R. M. Austin* 256), both cited by him in the monograph, are quite glandular on the upper stem. This segregate appears to be identical with var. indicta Jepson.

Var. **indicta** Jepson. Leaf-segments filiform or nearly so; petals suborbicular or somewhat fan-shaped; filaments broadly subulate.—Thinly wooded low gravelly hills, western Tehama Co. Also southern Oregon.

Refs.—Potentilla daucifolia Greene, Pitt. 1:160 (1888), type loc. Klamath and Shasta valleys, *Greene;* Jepson, Man. 493, fig. 489 (1925). *Horkelia congesta* T. & G. Fl. 1:434 (1840); not H. congesta Hook (1829). *H. congesta* B. & W. Bot. Cal. 1:181 (1876) in part. *H. pilosa* Nutt.; T. & G. Fl. l.c. as synonym (1840); not P. pilosa Willd. (1799). *H. hirsuta* Lindl. Bot. Reg. sub t. 1997 (1837), type stated as from "California," in reality Umpqua River, s. Ore., *Douglas* (plant hirsute, ex char.); not P. hirsuta Michx. (1803). *P. congesta* var. *lobata* Lemmon, Bull. Torr. Club 16:221 (1889), type loc. Edgewood, Siskiyou Co., *Lemmon. Horkelia pulchra* Rydb. N. Am. Fl. 22:280 (1908), type loc. Mt. Shasta, *Parry* (leaflets less deeply cleft).

Var. INDICTA Jepson, Man. 493 (1925), type loc. Crane Creek, w. Tehama Co., *Jepson* 100p. *Horkelia caruifolia* Rydb.; Howell, Fl. Nw. Am. 181 (1898), type loc. sw. Ore.; Mem. Dept. Bot. Columbia Univ. 2:141, pl. 79 (1898), type loc. Ashland, Ore., *Howell* 685, 1129.

44. **P. howellii** Greene. KLAMATH HONEY-DEW. Stems suberect or ascending, slender, arising from a simple root-crown, 9 to 12 inches high, the leaves mostly basal; herbage green, sparsely villous; leaves pinnate, the basal with blades 1½ to 5 inches long; petioles ½ to 2¼ inches long; leaflets 11 to 23, 2½ to 4 lines long, 2 to 4-cleft almost to base into oblong or linear-lanceolate segments; stipules of basal leaves finely 2 or 3 times dichotomously filiform-divided, villous; cymes dichotomous, with spreading or divaricate branches ending in 2 or 3-flowered clusters; flowers 4 to 5 lines wide; calyx-lobes narrowly lanceolate; petals white, obovate, emarginate or truncatish, exceeding the calyx-lobes; stamens 10; filaments dilated, unequal; achenes 2 or 3, light brown, smooth.

Hill slopes, 1400 to 3000 feet: Humboldt Co. to Del Norte Co. North to southwestern Oregon. June-Aug.

Locs.—Hy-am-pum, e. Humboldt Co.; betw. Sommes Bar and Jims ranch, Klamath River, *Chandler* 1543; Gasquet, Del Norte Co., *M. S. Baker* 219. S. Ore.: Merlin, *Henderson* 1407.

Refs.—POTENTILLA HOWELLII Greene, Pitt. 1:104 (1887), type loc. Waldo, Ore., *Howell. Horkelia howellii* Rydb. Bull. Torr. Club 25:55 (1898); Mem. Dept. Bot. Columbia Univ. 2:142, pl. 81, figs. 1–5 (1898). *P. laxiflora* Drew, Bull. Torr. Club 16:151 (1889), type loc. Hy-am-pum Valley, Humboldt Co., *Chesnut & Drew;* Jepson, Man. 494 (1925). *Horkelia laxiflora* Rydb. Bull. Torr. Club 25:55 (1898), Mem. Dept. Bot. Columbia Univ. 2:141, pl. 80 (1898).

45. **P. sericata** Greene. SILKY HONEY-DEW. Stems slender or filiform, erect from a branched root-crown, purplish, thinly pubescent or glabrate, 8 to 15 inches high, the leaves mostly basal, the cauline few and small; leaves slender, silvery-villous, densely crowded with leaflets, the blades 1 to 2 inches long; petioles ¼ to ¾ inch long; leaflets 13 to 27, 1½ to 4 lines long, divided to the base into 2 or 3 segments, the segments oblong or oval, entire, or 1 to 3-toothed; stipules deeply 2-cleft and hairy; cymes loosely dichotomous with long slender forks ending in clusters of 2 or 3 flowers, rarely congested; flowers 3 to 4 lines wide; calyx-tube turbinate to hemispherical; petals white with pinkish center, cuneate, retuse, exceeding the calyx-lobes; stamens 10; filaments broadly dilated, those opposite the petals shorter, less broad; achenes 3 to 5, smooth.

Red soil of open flats, 2500 to 3000 feet: Del Norte Co. Extends into Curry Co., southwestern Oregon. June-July.

Locs.—Red Hill, *Jepson* 2901; Gasquet, *Peirson* 3749. Sw. Ore.: Waldo, *Howell.*

Refs.—POTENTILLA SERICATA Greene, Pitt. 1:104 (1887). *Horkelia sericata* Wats. Proc. Am. Acad. 20:364 (1885), type loc. "summit of the Coast Range," Curry Co., sw. Ore., *Howell. P. howellii* Jepson, Man. 494 (1925); not P. howellii Greene (1887).

46. **P. parryi** Greene. CHAMISE HONEY-DEW. Stems ascending, a little leafy, 4 to 8 inches high, offsetting by stolons and forming mat-like colonies 2 to 4 feet wide; herbage soft-pubescent; leaves pinnate, the blades 1¾ to 4 inches long; petioles ½ to nearly as long; leaflets 7 to 13, cuneate, toothed at apex, 4 to 6 lines long; cyme diffuse, few- to several-flowered; flowers 4 to 5 (or 6) lines wide, on slender drooping pedicels 5 to 7 lines long; calyx-tube subrotate, 1 line wide, ¼ line high; petals white, obovate, obtuse, entire or toothed laterally at apex, exceeding the calyx-lobes; stamens 10; filaments oblong-lanceolate, those opposite the calyx-lobes longer and nearly twice as wide; achenes 7 to 12, gray, minutely reticulate.

Thin soil of the hills, often in shade of Adenostoma fasciculatum, 300 to 500 feet: Sierra Nevada foothills from Amador Co. to Calaveras Co. Apr.-June.

Locs.—Buena Vista, Amador Co., *Jepson* 9962; Ione, Amador Co., *Crum* 1104; Eldorado reservoir, Calaveras Co., *Davy* 1631. An extremely restricted endemic, its range will doubtless be somewhat extended by further exploration, especially northward.

Note on distribution.—Potentilla parryi and its var. wilderae differ by a number of more or less trivial distinctions, such as flower size and the shape of bractlets and calyx-lobes. More important are the differences in habit, and in the shape of the calyx-tube. Noteworthy also in var. wilderae is the extreme reduction in the number of pistils. The achenes also are somewhat different in shape and color. The discontinuous distribution of these two closely related forms is no novel occurrence among California species of Potentilla.

Var. **wilderae** Jepson. Plants lower (4 to 6 inches high); herbage less glandular, more densely silky-pubescent; flowers 2½ lines wide; calyx-tube ½ line high (deeper in proportion to width), truncate at base, strongly 10-nerved in fruit; pistils 1 to 4; achenes smooth, pale.—Montane, 7000 to 8000 feet: San Bernardino Mts. (South Fork Santa Ana River). June-Aug.

Refs.—POTENTILLA PARRYI Greene, Pitt. 1:102 (1887); Jepson, Man. 494, fig. 490 (1925). *Horkelia parryi* Greene, Bull. Cal. Acad. 2:416 (1887), type loc. Ione, Amador Co., *Edwards, Curran, Parry. H. platypetala* Rydb. Bull. Torr. Club 25:55 (1898); Mem. Dept. Bot. Columbia Univ. 2:133, pl. 67, figs. 1–5 (1898). Var. WILDERAE Jepson, Man. 494 (1925). *Horkelia wilderae* Parish, Bot. Gaz. 38:460 (1904), type loc. trail from Barton Flat to South Fork Santa Ana River, *C. M. Wilder* 237. *P. wilderae* M. & J. Bull. So. Cal. Acad. 24:8 (1925).

47. **P. douglasii** Greene. OREGON HONEY-DEW. Stems ½ to 1½ feet high; herbage minutely hispid to glabrate and usually more or less glandular; leaves mostly basal or sub-basal, the blades 2 to 5 (or 8) inches long, the petioles 1 to 2¾ inches long; leaflets 9 to 17, cuneate to cuneate-obovate, deeply toothed at apex or above the middle, 3 to 6 or rarely 9 lines long; cymes loosely branched with the clusters capitate or subcapitate or the whole cyme capitately congested; flowers 2½ to 3 (or 5) lines wide; calyx-tube bowl-shaped, purplish or pale, often 10-nerved; petals white, cuneate, retuse (rarely truncate or rounded), 1½ to 2 lines long, exceeding the calyx-lobes; stamens 10; filaments broadly dilated, those opposite the petals slightly shorter and narrower; achenes many, smooth or obscurely striate.

Montane meadows, 4000 to 9500 feet: Trinity and Siskiyou Cos.; Sierra Nevada from Fresno Co. to Shasta and Modoc Cos. East to Nevada, north to Oregon and Idaho. June-Aug.

Note on variation.—The plant originally named Horkelia fusca by Lindley (Potentilla douglasii Greene) is the most common and widespread form of a group which, although variable, apparently consists of one complex recognizable over an extensive range in Idaho, Oregon, Nevada and California. The original illustration (Bot. Reg. pl. 1997) is very similar to most of the plants cited below. Watson described var. tenella as a smaller-flowered form, low and slender, with leaves more deeply lobed. This is less extreme than var. tenuisecta, and intermediates occur which are very difficult to separate from the species. Although specimens with deeply divided leaves and open inflorescence present an appearance quite different from that of typical Potentilla douglasii, the characters which distinguish var. tenella are not constantly associated.

Locs.—North Coast Ranges: Big Flat, Salmon Mts., n. Trinity Co., *Hall* 8633; Weed, Siskiyou Co., *Butler* 1868. Sierra Nevada: Nellie Lake, Fresno Co., *A. L. Grant* 1076; Nevada Falls (above), Yosemite, *Chesnut & Drew* (leaflets finely toothed, intermediate toward var. tenella); Fish Camp, Mariposa Co., *Jepson* 8392; betw. Alder Creek and Peregoy Mdws., Yosemite, *Jepson* 4328; Matterhorn Cañon, Tuolumne Co., *Jepson* 3368; Cow Creek, Tuolumne Co., *Jepson* 6506 (cymes open); Dorrington, Calaveras Co., *Jepson* 10,110; Silver Lake, Amador Co., *Hansen* 292; Carson Pass, *Jepson* 8104; Mt. Tallac, *Jepson* 8089; Truckee River, Placer Co., *Sonne;* Cisco, Placer Co., *H. A. Walker* 1399 (cymes open); Bear Valley, Nevada Co., *Jepson* 121p, 122p; Stalkers, Shasta Co., *M. S. Baker* 298; Eagle Lake (mts. s.), Lassen Co., *Baker & Nutting;* Willow Creek, Modoc Co., *R. M. Austin* 110.

Var. **pseudocapitata** Jepson comb. n. Stems erect or ascending, 12 to 18 inches high; herbage densely pubescent, scarcely or not at all glandular; basal leaves 3 to 6 inches long; cymes capitate or compact with few branches.—Open places in pine forest, 3500 to 4900 feet: Sierra Co. (Sierraville, *Lemmon* 89) to Shasta Co. (Elk Flat, *Hall & Babcock* 4119) and Modoc Co. (Forestdale, *M. S. Baker*). June-Aug.

Var. **tenella** Greene. Leaflets more or less deeply incised with linear segments.—Meadows, 4300 to 7000 feet: Sierra Nevada, Tehama Co. to Tulare Co. North to Washington. June-Aug.

Locs.—Cannell Mdws., Tulare Co., *Hall & Babcock* 5117; Huntington Lake, Fresno Co., *E. Ferguson* 372 (intermediate toward the species); Little Yosemite, Mariposa Co., *Jepson* 3150; Jonesville, Butte Co., *Heller* 11,673; Prattville, Plumas Co., *Cleveland* 159; Warner Valley, Plumas Co., *R. M. Austin* 388; Battle Creek Mdws., Tehama Co., *J. Grinnell.*

Var. **tenuisecta** Jepson comb. n. Leaflets divided to the base into linear segments.—Meadows, 4400 to 5100 feet: Plumas Co. (Big Mdws., *Jepson* 4056); Lassen Co. (Martin Spr., Eagle Lake, *Brown & Wieslander*). North to Washington. June-July.

Refs.—POTENTILLA DOUGLASII Greene, Pitt. 1:103 (1887). *Horkelia fusca* Lindl. Bot. Reg. pl. 1997 (1837), type collected by *Douglas*, cited as "California," but undoubtedly Oregon or north; Rydb. Mem. Dept. Bot. Columbia Univ. 2:136, pl. 71 (1898); not Potentilla fusca Schlecht. (1839). *Horkelia capitata* Lindl. Bot. Reg. sub t. 1997 (1837), type from Cal., *Douglas. H. parviflora* Nutt.; H. & A. Bot. Beech. 338 (1838), "mountains of California," *Nuttall;* Rydb. l.c. 2:134, pl. 68, figs. 1–6 (1898); not P. parviflora Desf. (1804) or Gaud. (1830). *P. andersonii* Greene, Pitt. 1:104 (1887). *Horkelia brownii* Rydb. N. Am. Fl. 22:276 (1908), type loc. s. side Mt. Shasta, *H. E. Brown* 530. Var. PSEUDOCAPITATA Jepson. *Horkelia pseudocapitata* Rydb.; Howell, Fl. Nw. Am. 180 (1898), type loc. Janesville (not "Tanesville"), Lassen Co., *T. Brandegee.* Var. TENELLA Greene, Fl. Fr. 67 (1891). *Horkelia fusca* var. *tenella* Wats.; B. & W. Bot. Cal. 1:181 (1876), type from Sierra Co., *Lemmon. H. tenella* Rydb. Bull. Torr. Club 25:55 (1898); Mem. Dept. Bot. Columbia Univ. 2:136, pl. 72 (1898). Var. TENUISECTA Jepson. *Horkelia tenuisecta* Rydb. N. Am. Fl. 22:278 (1908), type loc. Falcon Valley, Wash., *Suksdorf* 2492.

48. **P. congesta** Baill. var. **tilingii** Jepson. SIERRA HONEY-DEW. Stems ascending or erect from a decumbent base, more or less leafy below, 5 to 13 (or 17) inches high, the leaves mostly basal; herbage silky-villous; leaves pinnate, the blades 1 to 3 (or 5) inches long, with 5 to 9 (or 11) approximate leaflets; petioles ½ to 2 (or 3) inches long; leaflets cuneate, varying to cuneate-elliptic or linear-oblong, usually 3-toothed at apex (otherwise entire), 4 to 6 (or 11) lines long; cyme much-branched, commonly rather open with the branches bearing capitate clusters, or the whole cyme rather dense, or the clusters reduced to one; flowers 2 to 3 lines wide, on slender pedicels; calyx-tube reddish or rusty, bowl-shaped or campanulate, 1¼ to 1½ lines wide, ¾ to 1 line high; petals white, linear or narrow-oblanceolate, acute at both ends, 1 to 1¾ lines long, slightly exceeding calyx-lobes; filaments narrowly linear-lanceolate; pistils 7 to 13; achenes rugulose-reticulate.

Sandy flats or openly forested ridges, 2300 to 6500 (or 8000) feet: North Coast Ranges from Lake Co. to Siskiyou Co.; Sierra Nevada from Tulare Co. to Modoc Co. North to Oregon. May-July.

Note on variation.—The seed of the original Potentilla congesta (*Horkelia congesta* Hook.) was undoubtedly collected near the "Umptqua River," southwestern Oregon, by Douglas. This original plant has broadly spatulate petals ("white with a yellowish claw") and very broadly dilated outer filaments described as "obcuneate," with the inner filaments narrower but still quite broadly subulate. Certain Oregon specimens, although differing in minor points, appear to represent the species (Woodville, *Thomas Howell* 185). Specimens from the more northerly localities in California, both coastal and interior, are somewhat variable in the shape of petals and filaments. In the Sierra Nevada, especially southward, the linear-acute petals and lanceolate filaments characteristic of var. tilingii are nearly always constantly associated. The forms described as Horkelia tridentata Torr. and H. flavescens Rydb. represent unusual phases intermediate toward the species with regard to the associated characters of filaments and petals.

Locs.—North Coast Ranges: Mt. Sanhedrin, w. Lake Co., *Hall* 9473; Soldiers Ridge, Yollo Bolly Mts., *Jepson* 103p; Larrabee Valley, Humboldt Co., *Tracy* 7025 (petals rounded at apex); Sisson, Siskiyou Co., *Jepson* 120p. Sierra Nevada: Round Mdw., Giant Forest, *Jepson* 705; Hume Lake, Fresno Co., *Harriet Kelley;* Dinkey Mdws., Fresno Co., *Crum* 1247; Curtin Mdws., near Tuolumne Grove, *Jepson* 10,551; Hetch-Hetchy, *A. L. Grant* 848; Belle Mdw., Tuolumne Co., *Jepson* 6472; Dorrington, Calaveras Co., *Jepson* 10,067; Silver Lake, Amador Co., *Hansen* 985; Donner Lake, *Sonne;* Bear Valley, Nevada Co., *Jepson* 119p; Big Mdws., Plumas Co., *Jepson* 4058; Forest Ranch, Butte Co., *Heller* 11,413; Warner Creek Valley, e. Tehama Co., *Jepson* 12,314; Forestdale region, sw. Modoc Co., *M. S. Baker.* P. congesta in typical form does not enter California but the following intermediates are perhaps nearer to the species than to the variety tilingii: Big Mdws., Plumas Co., *R. M. Austin;* Sierra Co., *Lemmon* 90 (type collection of Horkelia flavescens Rydb.); Placer Co., *M. E. P. Ames.*

Refs.—POTENTILLA CONGESTA Baill. Hist. Pl. 1:369 (1867–9). *Horkelia congesta* Hook. Bot. Mag. t. 2880 (1829), the type a cultivated plant, the seed collected by Douglas, undoubtedly on the "Umptqua River," s. Ore., not on "Cape Mendocino" which Douglas probably never visited. Var. TILINGII Jepson, Man. 496, fig. 491 (1925). *Horkelia tilingii* Regel, Acta Hort. Petrop. 1:153 (1871), type loc. Nevada City, *Tiling;* Gartenfl. t. 711 (1872). *P. tilingii* Greene, Pitt. 1:105 (1887). *Horkelia tridentata* Torr. Pac. R. Rep. 4:84, pl. 6 (1857), type loc. Duffield ranch, above Confidence, Tuolumne Co., *Bigelow;* not P. tridentata Soland. (1789). *Ivesia tridentata* Gray, Proc. Am. Acad. 7:338 (1868). *H. flavescens* Rydb. Mem. Dept. Bot. Columbia Univ. 2:138, pl. 75 (1898), type loc. Sierra Co., *Lemmon* 60 (petals, in isotype, oblanceolate, obtuse; filaments dilated).

11. GEUM L.

Perennial herbs. Leaves lyrately pinnate. Stipules adnate to the sheathing petioles. Flowers rather large, solitary or corymbose. Calyx persistent, 5-lobed, usually with 5 alternate bractlets. Stamens many. Pistils numerous, borne on a clavate or hemispheric receptacle; ovule 1. Achenes small, tipped with the elongated styles.—Species about 50, all continents, temperate and arctic regions. (The Latin name.)

Style jointed and kinked above the middle, 1½ to 4 lines long, glabrous or subglabrous except at the hirsute base, the upper part deciduous, the lower hooked; achenes and styles strongly deflexed in fruit; calyx-lobes reflexed.
  Terminal leaflet round-cordate; receptacle naked or nearly so........1. *G. macrophyllum.*
  Terminal leaflet cuneate-obovate; receptacle densely short-hairy........2. *G. strictum.*
Style straight, evidently jointed, or sometimes not jointed, the short terminal portion glabrous, persistent or very tardily deciduous, the lower portion conspicuously plumose, much elongated (¾ to 1½ inches long); achenes and styles erect or spreading in fruit; calyx-lobes not reflexed........3. *G. ciliatum.*

1. **G. macrophyllum** Willd. BIG-LEAF AVENS. Stems erect, coarse, mostly solitary, bristly, leafy, 1 to 3¼ feet high; herbage hispid-bristly; basal leaves (including the petiole) 4 to 15 inches long, the leaflets incised and serrate; terminal leaflet very large, round-cordate (2 to 5 inches long), the lateral ones downwardly smaller and with very small ones between; stem leaves reduced; cyme open, few-flowered; flowers 6 to 8 lines wide; bractlets small, often wanting; petals yellow; receptacle oblong; fruiting heads globose or slightly elongate, 6 to 10 lines long; achenes puberulent, densely bristly above, tailed with a naked style, the terminal portion deciduous, the persistent part hooked.

Wet ground, montane, 3500 to 10,000 feet, along the coast 50 to 5000 feet: San Bernardino Mts.; White Mts.; Sierra Nevada from Tulare Co. to Modoc Co.; North Coast Ranges. North to Alaska, east to Newfoundland and New Hampshire. May-Aug.

Locs.—San Bernardino Mts.: Tylers Mill, *Parish;* Bluff Lake, *Munz* 10,569. White Mts.: *Shockley* 659. Sierra Nevada: Sequoia Park, *W. Fry;* Junction Mdw., Kern Cañon, Jepson 1050; Dinkey ranger sta., Fresno Co., *A. L. Grant* 1190; Bear Valley, Nevada Co., *Jepson* 13,863; Pine Creek, Lassen Co., *M. S. Baker;* Goose Valley, Shasta Co., *Baker & Nutting;* Lookout, Modoc Co., *M. S. Baker;* Goosenest foothills, e. Siskiyou Co., *Butler* 1592. North Coast Ranges: Elk Mt., n. Lake Co., *Tracy* 2273; Willits (range n. of), *Davy* 5098; betw. Kneeland and Eureka, *M. S. Baker* 184; Gilbert Creek, Del Norte Co., *Jepson* 9355; Shackelford Creek, Siskiyou Co., *Butler* 1506.

Refs.—GEUM MACROPHYLLUM Willd. Enum. Hort. Berol. 557 (1809), type loc. Kamtchatka; Jepson, Man. 497, fig. 492 (1925). *G. strictum* var. *b* Hook. Fl. Bor. Am. 1:175 (1834), type loc. Fort Vancouver, Columbia River.

2. **G. strictum** Soland. YELLOW AVENS. Similar to G. macrophyllum; leaflets cuneate-obovate; terminal leaflet simple or 3-lobed, obovate-cuneate, doubly and irregularly incised-serrate, 3 inches long, 2 inches wide; receptacle cylindric; fruiting heads elliptic, 1 inch long; achenes thinly hirsute above.

Wet meadows, 2500 to 5000 feet: Lassen and Siskiyou Cos. North to British Columbia, east to Newfoundland, south to northern Mexico. June.

Locs.—Horse Lake, Lassen Co., *Jepson* 7810; Sisson, Siskiyou Co., *Jepson* 13,864.

Refs.—GEUM STRICTUM Soland; Ait. Hort. Kew. 2:217 (1789), type from N. Am.; Jepson, Man. 497 (1925). *G. canadense* Murr. Novi Comm. Gott. 5:33 (1783); not G. canadense Jacq. (1772).

3. **G. ciliatum** Pursh. PRAIRIE-SMOKE. Stems clustered, simple, nearly naked, 6 to 14 inches high; herbage white-pilose; leaves (including the short petiole) 3 to 7 inches long; leaflets several or many, somewhat crowded, cuneate in outline, ¾ to 1½ inches long, cleft into linear or cuneate toothed segments; cymes 1 to 3-flowered; flowers 7 to 9 lines wide, borne on long peduncles; calyx dull reddish; bractlets linear, 4 to 9 lines long; petals pale yellow, or reddish-tinged; styles more or

less evidently jointed near the summit, the upper portion usually at length deciduous; receptacle small, hemispherical; achenes with plumose tails, the tails at length ¾ to 1½ inches long, jointed toward the tip, the tip not hairy.

Moist hill slopes and flats, 4000 to 8500 feet: Nevada Co.; Modoc Co. to Siskiyou Co. North to Alberta, east to Newfoundland. June-July.

Tax. note.—In typical Geum ciliatum Pursh the style is more or less obviously jointed with the upper node at length deciduous, while in typical Geum triflorum Pursh the style is unjointed and wholly persistent. Many plants with the style unjointed, however, occur in the Geum ciliatum group. Typically again, Geum ciliatum has deeply parted or dissected leaflets, while G. triflorum has toothed or less deeply cleft leaflets. Both leaf forms occur in California; in the plants with deeply parted leaflets the styles are more evidently jointed and deciduous at tip, but the combination of deeply parted leaflets and unjointed styles also occurs (Modoc Co., *R. M. Austin*). Since the unjointed styles are to be regarded as a tendency, the generic standing of both Erythrocoma Greene and Sieversia Willd. is discredited (cf. C. P. Smith, Muhl. 8:1–17). Also because of the fact that G. ciliatum and G. triflorum are not entirely separable on style and leaf characters but simply represent two common phases of one group, the latter should be reduced to varietal standing. The specimens cited below are representative of G. ciliatum.

Locs.—Truckee, *Sonne* 75; Lake City Pass, Warner Mts., *Austin & Bruce* 2158; Egg Lake, Modoc Co., *Nutting;* Forestdale, sw. Modoc Co., *M. S. Baker;* Goosenest foothills, *Butler* 922.

Var. **triflorum** Jepson comb. n. Leaflets less deeply dissected; styles not jointed or indistinctly jointed, persistent.—Easterly summits and valleys of the Sierra Nevada from Alpine Co. to Nevada Co. North to Alberta, east to New York.

Locs.—Ebbetts Pass, *Brewer* 2064; Keiths Dome, Eldorado Co., *Ottley* 802; Lucille Lake, Eldorado Co., *M. S. Baker;* Lakeside Park, Lake Tahoe, *Mary W. Tyrrell;* Donner Pass, Nevada Co., *Heller* 7159 (styles more or less jointed, intermediate towards the species).

Refs.—GEUM CILIATUM Pursh, Fl. 352 (1814), type loc. "banks of the Kooskoosky" (Idaho), *Lewis. G. pubescens* Hook. Fl. Bor. Am. 1:175 (1834), the species name an error in copying from Pursh, l.c. *Sieversia ciliata* Don, Gen. Syst. 2:528 (1832). *Erythrocoma ciliata* Greene, Lflts. 1:177 (1906). *G. triflorum* Jepson, Man. 497 (1925) in part. Var. TRIFLORUM Jepson. *G. triflorum* Pursh, Fl. 736 (1814), type loc. "Upper Louisiana" (S. Dak.), *Bradbury;* Jepson, l.c., in part. *Sieversia triflora* R. Br.; Richards, Bot. App. Frankl. Journ. ed. 2, 21 (1823). *Erythrocoma triflora* Greene, l.c. 175. *E. canescens* Greene, l.c. 178, type loc. Ebbetts Pass, Alpine Co., *Brewer* 2064. *Sieversia canescens* Rydb. N. Am. Fl. 22:409 (1913).

12. **FALLUGIA** Endl.

Low deciduous shrub. Leaves pinnately lobed, with revolute margins. Flowers white, showy, solitary on the ends of long nearly naked peduncles. Receptacle flat. Calyx-tube short-hemispherical. Calyx-lobes 5, ovate. Bractlets 5, linear. Petals orbicular. Stamens numerous, inserted in 3 rows upon the margin of the calyx-tube. Pistils numerous, glabrous. Style terminal, very villous at the base, twisted, persistent.—Species 1. (V. Falugi, abbot of Vallombrosa.)

1. **F. paradoxa** Endl. APACHE PLUME. Much branched, 1 to 5 feet high; branchlets slender, elongated, with white, soon exfoliating epidermis; herbage pubescent, the under side of the leaves and the calyx usually rusty; leaves more or less fascicled, 3 to 6 lines long, cleft into 3 to 5 linear obtuse segments; flowers 1 to 1½ inches broad; calyx-lobes cuspidate, sometimes tricuspidate, exceeding the bractlets; achenes numerous, the thread-like plumose tails 1 inch long, often purple-tinged.

Gravelly or rocky slopes, 4000 to 5000 feet: eastern Mohave Desert (Providence Mts., New York Mts., Mescal Range). Southern Nevada to Colorado and Mexico. May.

Locs.—Providence Mts., *T. Brandegee;* Barnwell, *K. Brandegee;* Leastalk, *Parish* 1220; Mexican Well, Mescal Range, acc. *Peirson.* Nevada: Charleston Mts., *Purpus* 6060; Pioche, Lincoln Co., *Maud Minthorn* 72.

Refs.—FALLUGIA PARADOXA Endl.; Torr. in Emory, Notes Mil. Rec. 140, pl. 2 (1848); Jepson, Man. 497 (1925). *Sieversia paradoxa* Don, Trans. Linn. Soc. 14:576, t. 22, figs. 7–10 (1825), type from Mexico, *Mociño & Sesse. Geum? cercocarpoides* DC.; Ser. in DC. Prod. 2:554 (1825). *Fallugia mexicana* Walp. Rep. 2:46 (1843).

13. COWANIA Don

Shrubs or small trees. Leaves small, pinnately lobed, coriaceous, gland-dotted. Flowers showy, solitary and terminal on the short branchlets. Calyx-tube broadly clavate. Petals orbicular or obovate, spreading. Stamens numerous, in 2 rows. Pistils about 5 to 10, densely villous; style terminal; ovule solitary. Achenes coriaceous, striate, nearly included in the enlarged calyx-tube, tailed with the elongated plumose style.—Species 3, Mexico and southwestern United States. (James Cowan, British merchant and botanical amateur, died at Lima, 1823.)

1. **C. mexicana** Don var. **stansburiana** Jepson. CLIFF ROSE. (Fig. 165.) Freely branching shrub, 1 to 3 (or 6) feet high; leaves tending to be fascicled on the short branchlets, 3 to 4 lines long, pinnately 3 to 5-parted into short linear lobes, dark green above, white-tomentose beneath, the margin somewhat revolute; flowers yellow, 6 to 9 lines broad; calyx-tube glandular-pubescent, attenuate into a short pedicel; calyx-lobes roundish; tail of the achene 1½ to 2 inches long.

Arid mesas and cañon sides, 4100 to 7500 feet: eastern Mohave Desert; Inyo Co. East to Utah, south to Mexico. June.

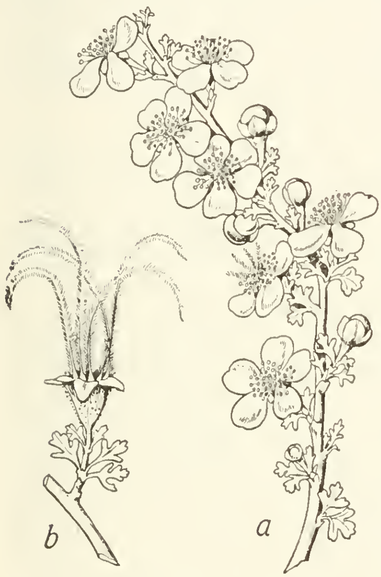

Fig. 165. COWANIA MEXICANA Don var. STANSBURIANA Jepson. *a*, fl. branchlet, × ⅔; *b*, fr., × ¾.

Note on variation.—The campanulate calyx-tube of Cowania mexicana Don may vary in width in the same general locality (cf. Durango, *Palmer* 12 and *Palmer* 71) just as does the funnelform calyx-tube of the var. stansburiana (cf. Silver Cañon, White Mts., *J. Grinnell, Jepson* 7222), while spms. from the New York Mts., eastern Mohave Desert, are intermediate. Such facts indicate that the northern form is more accurately designated as a variety than as a species. The variety dubia Bdg., rarely collected, has been thought to be a hybrid between Cowania mexicana var. stansburiana and Purshia tridentata (Zoe 5:149).

Locs.—Silver Cañon, White Mts., *Jepson* 7222; Inyo Mts., Inyo Co., *Purpus* 5804; Emigrant Cañon, Panamint Range, *Jepson* 7118; Hanaupah Cañon, Panamint Range, Jepson 6952; Bonanza King Mine, Providence Mts., *Munz* 4053; Barnwell, New York Mts., *K. Brandegee*.

Var. **dubia** Bdg. Flowers perfect and staminate; stamens fewer; pistils 2 or 3; tails of fruits short, not plumose but densely hairy.—Providence Mts., e. Mohave Desert.

Refs.—COWANIA MEXICANA Don, Trans. Linn. Soc. 14:575, t. 22, figs. 1–6 (1825), type from Mexico, *Mociño & Sesse*. Var. STANSBURIANA Jepson, Man. 498 (1925). *C. stansburiana* Torr.; Stansb. Expl. Great Salt Lake 386, pl. 3 (1852), type loc. Stansbury Isl., Great Salt Lake, Utah. *C. plicata* Torr. Frem. Rep. 314 (1845), collected by *Fremont*, doubtless in the Great Basin; not C. plicata Don (1825). *C. mexicana* Gray, Pl. Wright. 2:55 (1853); not C. mexicana Don (1825). Var. DUBIA Bdg. Zoe 5:149 (1903), type loc. Providence Mts., *T. Brandegee;* Jepson, Man. 498 (1925). *C. alba* Goodding, Bot. Gaz. 37:55 (1904), type loc. mts. s. of Bunkerville, Nev., *Goodding* 744.

14. ROSA L. ROSE

Prickly shrubs with pinnate leaves and adnate stipules. Flowers large, ours mostly rose-pink, solitary or in corymbs or panicles. Calyx-tube globose or urnshaped, becoming fleshy in fruit. Calyx-limb 5-parted. Petals 5 (rarely 6, 7 or 8), rounded or in ours mostly obcordate, spreading, inserted with the numerous stamens on the edge of the thin disk which lines the calyx-tube within and bears toward the base the numerous distinct pistils. Ovaries hairy, becoming bony achenes. Achenes enclosed in the globose or urnshaped calyx-tube or "hip."—Species about

100, north temperate regions of all continents, none in south temperate regions, but occurring in mountains of the tropics. (The ancient Latin name.)

Bibliog.—Lindley, J., Rosarum monographia, ed. 2, 1–156, tt. 1–18,—1830. Crepin, F., prodrome d'une monographie des roses américaines (Bull. Soc. Bot. Belg. 15:12–100,—1876). Watson, S., History and revision of the roses of N. Am. (Proc. Am. Acad. 20:324–352,—1885). Willmot, E. A., The genus Rosa (1:1–243,—1910–1911; 2:1–306,—1910–1912; the text descriptions accompanied by a large number of unnumbered plates, the greater part beautifully colored). Greene, E. L., Certain western roses (Lflts. 2:254–266,—1912). Rydberg, P. A., Roses of California and Nevada (Bull. Torr. Club 44:65–84,—1917); Roses of the Columbia River region (l.c. 48:159–172,—1921); Rosa in N. Am. Fl. 22:483–533,—1918. Täckholm, G., Zytologische Studien über die Gatt. Rosa (Acta Hort. Berg. 7:99–402, figs. 1–56,—1923). Hurst, C. C., Differential polyploidy in the genus Rosa L. (Zeitschr. Indukt. Abstam. u. Vererbungsl. Supplementb. 2:866–906,—1928); Genetics of the rose (Rose Annual, Rose Soc. London 1929:37–64, pls. 1–11, figs. 1–9,—1929); the general conclusion of the author is that there are in the genus 5 differential septets, each representing a distinct set of chromosomes and corresponding characters. There are thus 5 primary species. All other species are polyploids which may contain any of the 5 septets in any combination. Erlanson, Eileen W., Cytological conditions and evidences for hybridity in N. Am. wild roses (Bot. Gaz. 87:443–506, figs. 1–4 and pls. 16–19,—1929); Field observations on wild roses of the western U. S. (Mich. Acad. Sci. Arts and Letters. 11:117–135,—1930); The phenological procession in N. Am. wild roses in relation to the polyploid series (l.c. 11:137–150); American wild roses (American Rose Annual 1932:83–90).

Calyx-lobes persistent on fruit.
  Leaves commonly resinous-pubescent beneath; Humboldt Co. and northward....1. *R. nutkana.*
  Leaves usually not resinous beneath; hips often constricted into a short neck below calyx-lobes.
    Leaflets usually not glandular-dentate; stipules not glandular-dentate or glandular-ciliolate on the margins (except in 1 or 2 forms of R. pisocarpa); plants commonly 3 to 5 feet high.
      Stipules narrow, with the free tips commonly lanceolate.
        Spines usually stout, often curved; calyx-lobes 1 to 2 lines wide, more frequently non-glandular than glandular; herbage mostly pubescent; cismontane Cal........2. *R. californica.*
        Spines slender, straight; calyx-lobes narrow (1 to 1½ lines wide), usually not glandular; herbage glabrate or nearly; mostly desert and Great Basin areas........3. *R. woodsii.*
      Stipules usually strongly enlarged upwards and sagittate in outline; herbage subglabrous or somewhat puberulent, especially on the leaves beneath; calyx-lobes relatively short and broad, usually glandular; Lake Co. to Siskiyou Co........4. *R. pisocarpa.*
    Leaflets usually glandular-dentate; stipules usually glandular-ciliolate or glandular-dentate on the margins; plants ¾ to 3 feet high.
      Calyx-tube glandular-hispid; Coast Ranges and Sierra Nevada........5. *R. spithamea.*
      Calyx-tube glabrous; Sierra Nevada chiefly........6. *R. pinetorum.*
Calyx-lobes deciduous from fruit; Coast Ranges and Sierra Nevada........7. *R. gymnocarpa.*

1. **R. nutkana** Presl. NOOTKA ROSE. Stout, 2 to 5 feet high; prickles stout (rarely slender), usually straight, or the stem sometimes unarmed; leaves resinous-pubescent beneath or merely puberulent; stipules subequal in width from base to apex, mostly glandular-ciliate; flowers solitary or 2 to 4 together, the pedicels often prickly and glandular; calyx-tube glabrous; sepals prolonged into foliaceous, serrate or laciniate appendages; petals obcordate, ¾ to 1½ inches long; hips globose or depressed-globose, 5 to 7 lines in diameter.

Valley flats or hillslopes, 5 to 1500 feet: Humboldt and Siskiyou Cos. East to Utah, north to Alaska. May-June.

Locs.—Eureka, *M. S. Baker* 11; Bald Mt., n. Humboldt Co., *Tracy* 6345; Trinidad, n. Humboldt Co., *Geo. Parrish.*

Var. **hispida** Fer. Calyx-tube with gland-tipped bristles.—Humboldt Co.: Eureka, *Tracy* 6564. North to British Columbia, east to Utah and Montana. June-July.

Refs.—ROSA NUTKANA Presl, Epim. Bot. 203 (1849), type loc. Nootka Sound, B. C., *Haenke;* Jepson, Man. 498 (1925). *R. fraxinifolia* Hook. Fl. Bor. Am. 1:199 (1834); not R. fraxinifolia Borkh. (1790). *R. lyalliana* Crepin, Bull. Soc. Bot. Belg. 15:39 (1876), as synonym. *R. caryocarpa* Dougl.; Crepin, l.c., as synonym. *R. woodsii* Regel, Acta Hort. Petrop. 5:299 (1877); not

R. woodsii Lindl. (1820). *R. yainacensis* Greene, Pitt. 5:109 (1903), type loc. hills of Yainax Indian reservation, s. Ore., *Austin* (prickles few, pedicels densely glandular-hispid, leaves pale and puberulent below). *R. muriculata* Greene, Lflts. 2:263 (1912), type loc. Woodland, Cowlitz Co., Ore., *Coville* (leaves smaller and thicker, glandular-muriculate beneath). *R. brownii* Rydb. Bull. Torr. Club 44:70 (1917), type loc. n. side Mt. Shasta, *H. E. Brown* 349 (prickles weak, leaves pilose beneath, only slightly glandular). Var. HISPIDA Fer. Bot. Gaz. 19:335 (1894), based on Rock Creek, Mont., *Watson* 124, and Pullman, Wash., *Piper* 1540; Jepson, Man. 498 (1925). *R. macdougali* Holz. Bot. Gaz. 21:36 (1896), type from Ida., *Sandberg*. *R. nutkana* subsp. *macdougali* Piper, Contrib. U. S. Nat. Herb. 11:335 (1906).

ROSA RUBIGINOSA L. Mant. 2:564 (1771). Eglantine. Sweet Brier. Stems 5 to 8 feet high, with many strong hooked flattened prickles, sometimes also bristly; herbage aromatic; pedicels short, glandular-hispid; leaflets doubly serrate, resinous-dotted beneath; sepals pinnatifid, glandular-hispid, tardily deciduous; petals pink, notched at apex, 7 to 10 lines long; calyx-tube ovoid or pyriform, glabrous and unarmed, or sometimes with a few prickles at base.—European species cultivated in gardens, an occasional escape: betw. Fortuna and Carlotta, Humboldt Co., *Tracy* 3981; Hydesville, Humboldt Co., *Tracy* 4508; Yreka, *Butler* 1802.

2. **R. californica** C. & S. CALIFORNIA ROSE. Stout, 3 to 6 feet high; branchlets glabrous or pubescent, non-glandular or with gland-tipped hairs; prickles few or numerous, mostly stout and recurved, or sometimes straight, usually also with one or a pair below the stipules; leaves puberulent or pubescent, especially beneath, and more or less glandular; stipules narrow, with lanceolate tips, sometimes glandular-denticulate; flowers few to many, often 20 to 40 in a panicle; calyx-tube glabrous (rarely pilose), the lobes mostly prolonged into foliaceous serrate appendages; petals obcordate, ¾ to 1 inch long; pedicels hairy and more or less glandular; hips globose or ovoid, glabrous, 4 to 8 lines wide, usually somewhat constricted below the calyx-lobes.

Common everywhere on moist valley flats, along river and creek banks and margins of springs, often forming small thickets, 1 to 4000 feet: throughout cismontane California. May-Nov., flowering most freely in June.

Note on variation.—Rosa californica is a variable complex which has been segregated by various authors into a number of purported units. All of these segregates are about equally untenable since they are based upon such criteria as pubescent or glandular condition; prickles whether few or numerous, slender or stout, straight or curved; calyx-tube whether ellipsoid, oval or subglobose, or with depressed or constricted apex. It is believed, however, that the group represents a "hybrid swarm" and that the occasional outstanding specimens result from chance combinations of the independently varying characters of an interbreeding population. That they cannot be considered true species or even well-marked varieties is indicated by the general lack of geographic significance of these forms, and by the impossibility of so classifying any considerable number of plants. In the artificial groupings which result from such attempts, there are usually few or no specimens closely approximating the type, and plants representing unnamed associations of characters are as frequent as those which have been designated as species or varieties.

If in the case of Rosa californica, for example, a full geographic series of specimens had been available to the first describers of western roses it would seem that botanists (save for those to whom segregation is a fixed practice), would have proposed much fewer specific units. Differences, even slight and shadowy ones, have been emphasized out of proportion to the conditions that exist in nature. Resemblances have been minimized or ignored. A thicket of Rosa californica, one-eighth or one-fourth mile long, in a Coast Range valley (as in Napa Valley) presents in the field a marked uniformity as to the individuals which compose it. In the field resemblances are outstanding, the prevailing likenesses which make the assemblage a natural specific unit are very obvious. It is possible, to be sure, from such thickets to make specimens which will exhibit certain individual variations; nevertheless when once such specimens are dissociated from the main living mass, undue importance is attached to the peculiarities which they show. Practically the same series of variations which mark R. californica occur in R. woodsii and R. pisocarpa, and to a less extent in R. nutkana.

Out of hundreds of specimens of R. californica one finds a few which combine the particular fluctuating variations corresponding to a described segregate. In the list of stations indicated below, such specimens are particularized by the name of the segregate in parenthesis; the remainder, in general, represent Rosa californica in a fairly typical way. Coast Ranges: Yreka, *Butler* 1045; Hupa Valley, n. Humboldt Co., *Chandler* 1334; Willow Creek, Trinity River, *Tracy* 3410 (R. myriantha Carr.); Blue Slide, Van Duzen River, *Tracy* 6563; Camp Grant, Eel River, *Davy* 5492; Ukiah, *Davy* 1015; Miller Cañon, Vaca Mts., *Jepson* 13,885; Suisun Valley, *Jepson* 10,234;

Santa Rosa, *Chesnut;* West Berkeley, *Davy* 402 (R. pilifera Rydb.); Niles, *Ruth Shinn;* Black Mt., Santa Clara Co., *Elmer* 4284; Saratoga, Santa Clara Co., *Davy* 316b (R. aldersonii Greene); Pajaro Hills, n. Monterey Co., *Chandler* 459; San Luis Obispo, *Summers* 256. Great Valley: Stillwater, Shasta Co., *M. S. Baker;* Princeton, Colusa Co., *Chandler;* Grand Isl., lower Sacramento River, *Jepson* 13,884; San Joaquin River, betw. Stockton and Tracy, *Tidestrom.* Sierra Nevada: Clover Creek Falls, Shasta Co., *M. S. Baker;* San Andreas, *Davy* 1636; Columbia, Tuolumne Co., *Jepson* 6348 (R. aldersonii Greene); Hetch-Hetchy, *Jepson* 3440 (R. pilifera Rydb.); Dorst Creek, Tulare Co., *W. Fry* (R. pilifera Rydb.); Middle Tule River, *Purpus* 5682. S. Cal.: Santa Monica Cañon, *Barber* 55; San Antonio Creek, San Gabriel Mts., *Peirson* 84 (R. myriantha Carr.); Waterman Cañon, San Bernardino Mts., *Parish;* Santa Rosa Mts., *Munz* 5901; Mesa Grande, San Diego Co., *E. Ferguson* 47; Laguna Mts., San Diego Co., *T. Brandegee;* Witch Creek, San Diego Co., *Alderson;* Pacific Beach, San Diego Co., *M. S. Snyder* (R. brachycarpa Rydb.); San Diego, *M. F. Spencer* 140.

Refs.—ROSA CALIFORNICA C. & S. Linnaea 2:35 (1827), type loc. San Francisco, *Chamisso;* Jepson, Fl. W. Mid. Cal. 278 (1901), ed. 2, 206 (1911), Man. 498, fig. 494 (1925). *R. californica* var. *chamissoniana* C. Mey. Zimmtr. 18 (1847). *R. californica* var. *pubescens* Crepin, Bull. Soc. Bot. Belg. 15:52 (1876), as synonym. The six following synonyms refer to the more glandular forms or phases: *R. californica* var. *petersiana* C. Mey. Zimmtr. 19 (1847). *R. californica* var. *glandulosa* Crepin, l.c. *R. aschersoniana* Crepin, l.c., as synonym. *R. aldersonii* Greene, Pitt. 5:110 (1903), type loc. Witch Creek, San Diego Co., *Alderson.* *R. breweri* Greene, Lflts. 2:262 (1912), type loc. San Jose, *Brewer* 828. *R. greenei* Rydb. Bull. Torr. Club 44:71 (1917), type loc. Santa Cruz Isl., *Greene.* *R. brachycarpa* Rydb. l.c., type loc. Temescal Cañon near Elsinore, Riverside Co., *McClatchie.* All of the preceding forms have curved prickles. The following forms have straight prickles and are less glandular except the last. *R. myriantha* Carr. Rev. Hort. 448 (1865), type cultivated, seeds from Cal. (prickles stout, calyx-tube depressed-globose). *R. davyi* Rydb. Bull. Torr. Club 44:76 (1917), type loc. Saratoga, Santa Clara Co., *Davy* 263 (prickles numerous, 5 lines long, leaves more pubescent). *R. pilifera* Rydb. l.c. 80, type loc. San Francisco, *Bolander* (prickles slender, calyx-tube pilose when young). *R. johnstonii* Rydb. N. Am. Fl. 22:521 (1918), type loc. Upland, San Bernardino Valley, *Johnston* 2050 (prickles few and weak, leaves pubescent, non-glandular). *R. santa-crucis* Rydb. Bull. Torr. Club 44:73 (1917), type loc. Santa Cruz Isl., *Greene* (prickles stout, leaves very glandular).

3. **R. woodsii** Lindl. var. **ultramontana** Jepson comb. n. DESERT ROSE. Stems 3 to 5 feet high; prickles slender, usually terete, straight or rarely recurved, or plants sometimes nearly unarmed; lower stipules narrow, upper dilated, the free portion ovate to lanceolate, often slightly glandular-pruinose, not glandular-denticulate or rarely; leaves glabrous above, puberulent and sometimes a little glandular beneath; flowers usually several in a corymbose cluster; pedicels glabrous; calyx-lobes lanceolate, 4 to 5 lines long, tomentose within and on the margins, non-glandular; petals about 7 to 9 lines long; hips globose or ovoid, 4 to 5 lines long.

Valley flats, cañon bottoms or montane meadows in ranges bordering or in the deserts, 3500 to 6500 feet: mountain slopes facing the western Mohave Desert; Inyo Co. ranges; east side or easterly high valleys of the Sierra Nevada from Kern Co. to Modoc Co. North to eastern Oregon. June-July.

Locs.—Rock Creek Cañon, San Gabriel Mts., Los Angeles Co., *Peirson* 470; Wild Rose Cañon, Panamint Range, *Jepson* 7128; Bishop Creek, Inyo Co., *Shockley* 376; Mono Ranger Mdw., Mono Creek, e. Fresno Co., *Jepson* 13,221; Sonora Pass, *Jepson* 6580; Convict Creek, Mono Co., *Almeda Nordyke;* Indian River, Taylorsville, Plumas Co., *Jepson* 8018; Boni ranch, Long Valley, Lassen Co., *Jepson* 7782; Honey Lake Valley, *Jepson* 7801; Eagle Lake, Lassen Co., *Brown & Wieslander;* Surprise Valley, Modoc Co., *Jepson* 7847. Nevada: Glendale, Washoe Co., *Kennedy.*

Var. **mohavensis** Jepson comb. n. MOHAVE ROSE. Stems slender; herbage nearly glabrous and non-glandular; prickles scattered, slender, mostly straight; leaves more or less shining above; flowers solitary or in corymbs of 2 or 3; petals 7 lines long; hips globose.—Arid or desert slopes, 4000 to 6200 feet: San Bernardino and San Gabriel mountains; Inyo Co.

Locs.—Swartout Cañon, San Antonio Mts.; Box S Spr., *Chandler;* Nelson Range, *Hall & Chandler* 7127.

Refs.—ROSA WOODSII Lindl. Ros. Monog. 21 (1820), type loc. "near the Missouri River." Var. ULTRAMONTANA Jepson. *R. californica* var. *ultramontana* Wats. Bot. Cal. 1:187 (1876), type loc. "eastern side of the Sierra Nevada"; Jepson, Man. 499 (1925). *R. ultramontana* Hel. Muhl. 1:107 (1904). *R. blanda* Wats. Bot. King 91 (1871), in part; not R. blanda Ait. (1789). *R. macounii* Greene, Pitt. 4:10 (1899), type loc. Assiniboia, *J. Macoun* (prickles stoutish, deflexed, plant nearly glabrous and non-glandular, leaflets obovate, usually cuneate at base, pale beneath, fruits depressed-globose). *R. puberulenta* Rydb. Fl. Rocky Mts. 443 (1917), type loc. Montezuma

Cañon, Monticello, Utah (prickles curved). *R. pyrifera* Rydb. l.c. 445, type loc. shores of Lake Pend d'Oreille, Ida., *Sandberg, MacDougal & Heller* 871 (fruits pyriform, leaves light green, glandular). *R. salictorum* Rydb. Bull. Torr. Club 44:77 (1917), type loc. Gold Creek, Nev., *Nelson & Macbride* 2113 (prickles few, leaves large, thin, broadly oval). *R. gratissima* Greene, Fl. Fr. 73 (1891), type loc. mts. of Kern Co., probably Tehachapi, *Greene*. *R. pisocarpa* var. *gratissima* Jepson, Man. 499 (1925). Var. MOHAVENSIS Jepson. *R. mohavensis* Parish, Bull. S. Cal. Acad. 1:87 (1902); Jepson, Man. 499 (1925); the Parish name resting on *R. californica* var. *glabrata* Parish, Erythea 6:88 (1898), type loc. Cushenbury Sprs., n. side San Bernardino Mts., *Parish* 2481; not R. glabrata Kit. (1863).

4. **R. pisocarpa** Gray. CLUSTER ROSE. Slender, 3 to 5 feet high; prickles few, slender and straight, or none; leaves green and glabrous above, paler and often puberulent beneath, not glandular, leaflets finely serrate; stipules strongly and often abruptly dilated upwards and so inversely sagittate; flowers in corymbs or solitary; calyx-lobes prolonged into a slender terminal entire linear or lanceolate appendage, often glandular-hispid; petals obcordate, 6 to 8 lines long; hips globose, 3 to 5 lines in diameter, contracted above into a very short neck.

Rich hill slopes and valley or cañon flats, 50 to 3000 feet: Lake, Humboldt and Trinity Cos. to Shasta, Siskiyou and Del Norte Cos. North to British Columbia. June-Aug.

Locs.—Elk Mt., n. Lake Co., *Tracy* 2305; Trinity River near the South Fork, Humboldt Co., *Tracy* 7079, 6550 (R. pringlei Rydb.); Redding, *Blankinship* (R. eastwoodii Rydb.); Mt. Eddy, Siskiyou Co., *Copeland* 3875 (R. copelandii Greene); Delta, Shasta Co., *Jepson* 6182; Yreka, *Butler* 1352 (R. pringlei Rydb.); Yreka Creek, Siskiyou Co., *Butler* 1804 (R. chrysocarpa Rydb.); Gilbert Creek, nw. Del Norte Co., *Jepson* 9385 (R. pringlei Rydb.).

Var. rivalis Jepson. Glabrous; prickles few or none; leaflets thin, rather prominently feather-veined, 1 to 1½ inches long.—Mendocino Co.; Humboldt Co. (betw. Sommes Bar and Jims ranch, Klamath River, *Chandler* 1544).

Refs.—ROSA PISOCARPA Gray, Proc. Am. Acad. 8:382 (1872), type loc. Ore., *Elihu Hall;* Jepson, Man. 499 (1925). *R. nutkana* var. *microcarpa* Crepin, Bull. Soc. Bot. Belg. 15:45 (1876). *R. copelandii* Greene, Lflts. 2:264 (1912), type loc. Mt. Eddy, Siskiyou Co., *Copeland* 3875 (prickles stout, herbage glabrous and non-glandular except for tomentose sepals). *R. chrysocarpa* Rydb. Bull. Torr. Club 44:74 (1917), type loc. Allen Cañon, Utah, *Rydberg & Garrett* 9302 (leaves glabrous, stipules glandular-dentate or -ciliate, sepals tomentose within and marginally). *R. pringlei* Rydb. l.c. 79, type loc. Siskiyou Co., *Pringle* (nearly unarmed, leaves puberulent, hip elongate, constricted at the neck). *R. eastwoodii* Rydb. N. Am. Fl. 22:527 (1918), type loc. Sisson, Siskiyou Co., *Eastwood*. Var. RIVALIS Jepson, Man. 499 (1925). *R. rivalis* Eastw. Bull. Torr. Club 32:198 (1905), type loc. Laytonville, Mendocino Co., *Eastwood*.

5. **R. spithamea** Wats. GROUND ROSE. Simple or sparingly branched, about 1 foot high; prickles few, slender, straight; leaves minutely pubescent and more or less glandular, especially on the petioles; stipules narrow, acute or acuminate; pedicels and calyx usually hispid with gland-tipped hairs; flowers solitary or few; calyx-lobes with entire linear or lanceolate appendages; petals obcordate, 5 to 8 lines long; hips globose, 3 to 5 lines broad.

Grassy slopes in open woods, 600 to 4000 feet: North Coast Ranges from Humboldt Co. to Lake Co.; Sierra Nevada from Mariposa Co. to Tulare Co. June-Aug.

Locs.—North Coast Ranges: South Fork Mt., Trinity Co., *Tracy* 6497; Trinity River valley, near the South Fork, *Tracy* 7196; Grouse Creek, Humboldt Co., *Chesnut & Drew;* Elk Mt., n. Lake Co., *Jepson* 13,896. Sierra Nevada: Mariposa Big Trees; Old Colony Mill, Marble Fork Kaweah River, *Jepson* 640.

Var. sonomensis Jepson. SONOMA ROSE. Stems densely armed with stout straight or slightly recurved prickles; leaflets with the teeth minutely glandular-denticulate; flowers several in a corymb; calyx-tube very densely glandular-hispid.—Dry slopes, 50 to 2000 feet: outer Coast Ranges from San Luis Obispo Co. to Mendocino Co.

Locs.—Pajaro Hills, Monterey Co., *Chandler* 438; Saratoga, Santa Clara Co., *Davy* 316; Mt. Tamalpais, *Jepson* 13,895; Comptche, Mendocino Co., *H. A. Walker* (intermediate toward the species).

Refs.—ROSA SPITHAMEA Wats. Bot. Cal. 2:444 (1880), type loc. Trinity River, *Rattan;* Jepson, Man. 499 (1925). Var. SONOMENSIS Jepson, Fl. W. Mid. Cal. 279 (1901), ed. 2, 206 (1911), Man. 499 (1925). *R. sonomensis* Greene, Fl. Fr. 72 (1891), type loc. Petrified Forest, Sonoma Co., *Greene*. *R. granulata* Greene, Lflts. 2:262 (1912), type loc. San Luis Obispo, *Brewer*.

6. **R. pinetorum** Hel. Pine Rose. Stems slender, 2 to 3½ feet high; prickles straight, slender to somewhat stout; stipules short, more or less dilated, usually glandular on the backs and glandular-ciliolate on the margins; petioles and rachis prickly and glandular-hispid; leaflets elliptical to orbicular, more or less pubescent beneath and somewhat glandular, ¾ to 1½ inches long, the margins usually doubly serrate with gland-tipped teeth; flowers solitary or in corymbose clusters; petals obcordate, 5 to 7 lines long, the pedicels glabrous or glandular-hispid; calyx-tube glabrous, the lobes with foliaceous tips, glandular externally, tomentose within, the edges rarely glandular-ciliolate, erect and persistent in fruit; hips globose, glabrous, 4 to 8 lines long.

Pine woods, 2800 to 6500 feet: Sierra Nevada from Shasta Co. to Fresno Co.; Monterey coast. May.

Locs.—Sierra Nevada: Mariposa Big Trees, *Jepson* 5657 (R. bidenticulata Rydb.); North Fork, Madera Co., *Jepson* 12,869 (R. bidenticulata Rydb.). Monterey Co.: Pacific Grove, *Parish* 11,503.

Refs.—Rosa pinetorum Hel. Muhl. 1:53 (1904), type loc. Pacific Grove, Monterey Co., *Heller* 6817. *R. gymnocarpa* var. *pinetorum* Jepson, Man. 500 (1925). *R. bolanderi* Greene, Lflts. 2:261 (1912), type loc. Oakland, *Bolander* (sepals ovate, short-acuminate). *R. calvaria* Greene, l.c. 257, type loc. Calaveras Big Trees, *Greene* (leaflets pale beneath, petals about 5 lines long). *R. dudleyi* Rydb. Bull. Torr. Club 44:73 (1917), type loc. Boole's, Converse basin, Fresno Co., *Dudley* 3388 (prickles stouter, leaves thicker, glandular, more pubescent beneath than in R. calvaria Greene). *R. bidenticulata* Rydb. N. Am. Fl. 22:518 (1918), type loc. Castella, Shasta Co., *Eastwood* 1389 (leaves nearly glabrous beneath, prickles small, flowers solitary). *R. corymbiflora* Rydb. l.c. 519, type loc. between Pitt and Baird, Shasta Co., *Eastwood* 1404 (flowers corymbose).

7. **R. gymnocarpa** Nutt. Wood Rose. Slender, 1 to 3 feet high; pedicels, rachises, midrib of leaflets usually more or less glandular-hispidulose or -hispid, the leaflets otherwise glabrous; branchlets and rachises of the leaves densely armed with long slender straight prickles, or sometimes unarmed; leaves 2 to 3 inches long; leaflets ¼ to ¾ (or 1¼) inches long, elliptic or roundish, obtuse or acute, doubly serrate, the minute teeth gland-tipped; flowers generally solitary or in clusters of 2 or 3; petals 5 to 7 lines long; pedicels clothed with gland-tipped hairs, rarely glabrous, drooping or curving in fruit; calyx-lobes at length deciduous; hips ovate, pear-shaped or globose, glabrous, red, 4 to 8 lines long.

Shady woods or bushy north slopes, often near streams, 300 to 5500 feet: San Diego Co.; Coast Ranges from Monterey Co. to Siskiyou Co.; Sierra Nevada from Mariposa Co. to Modoc Co. North to British Columbia. May-June.

Locs.—San Diego Co.: Palomar Mt., *Jepson* 1501 (a variant, some of the hips with gland-tipped spines). Coast Ranges: Pacific Grove, *Tidestrom;* Saratoga, Santa Clara Co., *Davy* 315; Moraga Valley, Contra Costa Co., *Jepson* 13,887; Berkeley, *Jepson* 9815; Lagunitas, Marin Co., *Parish* 19,061; Sonoma Cañon, Kenwood, *Jepson* 10,013; Howell Mt., Napa Co., *Jepson* 13,892; Elk Mt., n. Lake Co., *Tracy* 2270; betw. Ft. Bragg and Sherwood, *Jepson* 13,889; Bull Creek, Humboldt Co., *Jepson* 16,462; Hupa, *Manning;* Shasta Sprs., Siskiyou Co., *Jepson* 13,890; Shackelford Cañon, w. Siskiyou Co., *Jepson* 2811; Humbug Mt., w. Siskiyou Co., *Butler* 1816. Sierra Nevada: Mariposa Big Trees, *Bolander;* Italian Bar, South Fork Stanislaus River, *Jepson* 6386; Carpenters Gulch, Amador Co., *Hansen* 806; Blue Cañon, Placer Co., *H. A. Walker* 1232; Rich Pt., Middle Fork Feather River, *Jepson* 10,605; Brush Creek, Butte Co., *Kate Conger;* Ft. Bidwell, ne. Modoc Co., *Manning* 49.

Var. **pubescens** Wats. Leaves minutely puberulent beneath; pedicels glabrous.—Sierra Nevada: Fresno Co. (Pine Ridge); Tamarack road, near Burney Valley, Shasta Co., *M. S. Baker;* Forestdale, Modoc Co., *M. S. Baker.*

Refs.—Rosa gymnocarpa Nutt.; T. & G. Fl. 1:461 (1840), type from Ore., *Nuttall;* Jepson, Fl. W. Mid. Cal. 278 (1901), ed. 2, 206 (1911), Man. 499 (1925). *R. spithamea* var. *subinermis* Engelm. Bot. Gaz. 6:236 (1881), type loc. "Big Trees of Fresno Co.," *Engelmann.* *R. glaucodermis* Greene, Lflts. 2:255 (1912), type loc. Shasta Sprs., Siskiyou Co., *Jepson* 13,890 (branchlets green, glaucous, leaflets petiolulate). *R. prionota* Greene, l.c. 256, type loc. foothills s. of Mt. Sanhedrin, Lake Co., *Heller* 5858 (leaflets more numerous, 7 to 9, smaller, teeth narrower, terminal leaflet cuneate at base). *R. piscatoria* Greene l.c., type loc. Pescadero, San Mateo Co., *Elmer* (leaves small, stems very hispid). Var. pubescens Wats. Bot. Cal. 1:187 (1876), type loc. Wawona (Clark's), Mariposa Co., *Gray.* *R. bridgesii* Crepin, Bull. Soc. Bot. Belg. 15:54 (1876), type from Cal., *Bridges* 62. *R. crenulata* Greene, Lflts. 2:255 (1912), type loc. Pine Ridge, Fresno Co., *Hall & Chandler* 171. *R. oligocarpa* Rydb. N. Am. Fl. 22:532 (1918), type loc. Goose Valley, Shasta Co., *Eastwood* 945 (leaflets oblanceolate, simply serrate).

15. **CHAMAEBATIA** Benth.

Low glandular-pubescent heavy-scented evergreen bush with dissected fern-like foliage. Leaves thrice pinnate, with numerous minute leaflets and very minute stipules. Flowers white, in loose terminal cymes. Stamens about 50 to 60 in several rows. Pistil one, simple; style densely villous at base; ovule one. Fruit an achene, included in the persistent calyx-tube.—Species 1. (Greek chamae, on the ground, low, and batos, a bramble.)

1. **C. foliolosa** Benth. Mountain Misery. (Fig. 166.) One to 2 feet high; leaf-blades obovate or ovate in outline, 1½ to 4½ inches long; leaflets crowded, ½ line long; calyx-tube glandular-hispid; calyx-lobes lanceolate, usually reflexed, about 2 lines long; petals obovate, 3 to 4 lines long; ovary more or less white-hirsute.

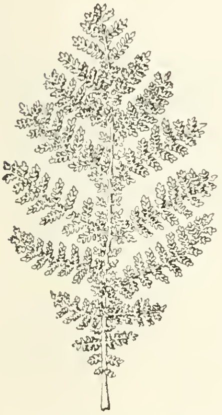

Fig. 166. Chamaebatia foliolosa Benth.; leaf, × ⅓.

Mountain slopes, 2000 to 6000 (or 7500) feet: Sierra Nevada from Sierra Co. to Kern Co. May-July.

Field note.—Chamaebatia foliolosa is commonly gregarious in the open Pinus ponderosa forest of the main ridges in the Sierra Nevada, reaching its greatest development from Nevada Co. to Mariposa Co. Except for herbaceous or grassy vegetation it tends to form pure colonies which are often very extensive. On some mountain slopes its growth is so even and uniform that at a distance a lawn-like effect is produced. On such areas it discourages reproduction of forest tree species and even grasses and similar herbs. On the South Fork Kaweah River it forms colonies under the tall chaparral. Cattle do not browse its herbage ordinarily, though it may be cropped somewhat after frost. Its balsamic or witch-hazel odor and tarry leaves make it well-known to mountaineers who call it Pine Tar Weed, Jerusalem Oak, Running Oak, Bear Clover, Bear Weed, Bear Mat, as well as most commonly Mountain Misery.

Locs.—Feather River, in the foothills, acc. *L. S. Smith;* Sierra Buttes, *Lemmon* 217; Newcastle, Placer Co., *W. W. Mackie;* Calaveras Big Trees, *Jepson;* Murphys, Calaveras Co., *Davy* 1515; Yankee Hill, Columbia, Tuolumne Co., *Jepson;* Ackerson Creek, Mariposa Co., *Jepson;* betw. Bowers Cave and Hazel Green, Mariposa Co., *Jepson* 13,851; Mariposa Big Trees, *Jepson* 8389; Fresno Big Trees, *Jepson;* Pine Ridge, Fresno Co., *Jepson;* McKinley Big Trees, *Jepson* 16,010; Cedar Creek, Tulare Co., *Jepson* 613; betw. Clough Cave and Garfield Forest, *Jepson;* Nelson, Middle Tule River, *Jepson.*

Var. **australis** Bdg. Plants 2 to 4 feet high; leaf-blades oblong-lanceolate in outline; ovary glabrous.—Hill slopes, 50 to 2000 feet: San Diego Co. South to northern Lower California. Feb.-May.

Locs.—Palomar, *Peters;* San Miguel Mt., San Diego Co., *Chandler* 5214; Monument 246, Mexican boundary, *F. Stephens.*

Refs.—Chamaebatia foliolosa Benth. Pl. Hartw. 308 (1848), type loc. "mountains of the Sacramento," *Hartweg,* that is, on the excursion to Bear Valley, Nevada Co., in the Pinus ponderosa belt (Erythea, 5:55); Hook. Bot. Mag. t. 5171 (1860); Jepson, Man. 500, fig. 495 (1925). Var. australis Bdg. Bot. Gaz. 27:447 (1899), type loc. La Grulla, L. Cal., *Orcutt;* Jepson, l.c. *C. australis* Abrams, Bull. Torr. Club 34:263 (1907).

16. **AGRIMONIA** L. Agrimony

Perennial herbs with pinnate leaves and serrate leaflets. Flowers yellow, in racemes. Bracts 3-cleft. Calyx-tube turbinate, contracted at the throat and the upper part beset with a ring of hooked prickles, indurated in fruit and enclosing the 2 achenes. Calyx-limb 5-cleft, the lobes closing over the throat after flowering. Stamens 5 to 15. Styles terminal.—Species 10, North America, Europe and Asia. (Corruption of the Greek word argema, a disease of the eye, the plants reputed medicinal.)

1. **A. eupatoria** L. Common Agrimony. Stems erect, 2 to 3 feet high; herbage glandular, and both hirsute and puberulent; leaflets 5 or 7, ovate or obovate, coarsely toothed, entire at base, 1 to 3½ inches long, also with interposed smaller ones 1 to 5 lines long; flowers 2½ lines long; fruiting calyx-tube with about 10 ridges, its bristles many, some of them erect, some spreading or reflexed.

Borders of woods in the mountains, 2500 to 4500 feet, widely disseminated but rare: Southern California mountains; North Coast Ranges; northern Sierra Nevada. North to Washington, east to the Atlantic coast. June-Aug.

Locs.—S. Cal. mts.: Cuyamaca Mts., *Palmer* 84; Palomar Mt., *T. Brandegee;* Yucaipa Cañon, San Bernardino Mts., *C. M. Wilder;* Potato Cañon, San Bernardino Mts. (Pl. World 20:218). North Coast Ranges: Howell Mt., *T. Brandegee;* Mt. St. Helena, *Alice King;* Cobb Mt., Lake Co., *M. S. Baker* 2232a; Tunis Mill, Elk Mt., Lake Co., *Jepson* 13,865. Northern Sierra Nevada: Greenville, Plumas Co., *Hall & Babcock* 4428; Whitmore, Shasta Co., *A. A. Weigart.* In all California plants examined the calyx-tube is glandular but not hispid. In most European specimens it is very hispid but in some glandular and glabrous as in ours.

Refs.—Agrimonia eupatoria L. Sp. Pl. 448 (1753), type from Europe; Jepson, Man. 500, fig. 496 (1925). *A gryposepala* Wallr. Beitr. Bot. 1:49 (1842), Pennsylvania and Peaks of Otter, Va.; Jepson, Fl. W. Mid. Cal. 284 (1901), ed. 2, 210 (1911).

17. ACAENA L.

Perennial herbs with a woody base, pinnate leaves and pinnatifid leaflets. Flowers green, in more or less crowded spikes. Calyx persistent, its tube contracted at the throat, at length armed with retrorsely barbed prickles. Calyx-lobes in ours 5, valvate, deciduous. Petals none. Stamens in ours 3 to 5. Pistil 1, sometimes 2; style terminal; stigma multifid-feathery; ovule solitary, suspended. Achene enclosed in the indurated calyx.—Species about 100, California, Hawaii, South America, South Africa, Australia and islands of the southern hemisphere. (Greek akaina, a thorn, in reference to the spines on the calyx.)

1. **A. pinnatifida** R. & P. var. **californica** Jepson. Stems erect with decumbent base, 5 to 13 inches high, sometimes almost naked, the leaves mostly at base or tufted on the short woody branches of the root-crown; herbage villous; leaflets 11 to 17, nearly uniform, 3 to 4 lines long, pinnately cleft into 3 to 7 segments; calyx-tube in fruit prickly, 4-angled; stamens dark purple, exserted.

Dry or rocky soil of hilltops or north slopes near the ocean, 25 to 1500 feet: Sonoma and Contra Costa Cos. to Monterey Co. May-June.

Locs.—Watson School, Bodega, *Jepson* 15,933; Novato, Marin Co., *Jepson* 9056; Berkeley Hills, *Jepson* 9639; Oakland Hills, *Jepson* 10,396; Crystal Springs Lake, San Mateo Co., *C. F. Baker* 688; San Juan, San Benito Co., *Brewer* 719; Gigling sta., Monterey Co., *Heller* 6712.

Refs.—Acaena pinnatifida R. & P. Fl. Per. et Chil. 1:68, t. 104b (1798), type loc. Chile. Var. californica Jepson, Man. 501, fig. 497 (1925). *A. californica* Bitt. Biblio. Bot. 74:116 (1910), type from Cal. *A. trifida* Cal. auct.; Jepson, Fl. W. Mid. Cal. 284 (1901), ed. 2, 210 (1911). *A. pinnatifida* Torr. Bot. Mex. Bound. 63, pl. 19 (1859).

18. SANGUISORBA L. Burnet

Herbs with unequally pinnate leaves. Flowers small, perfect, polygamous or dioecious, crowded in a dense head or spike at the summit of a long naked peduncle. Calyx-tube turbinate, constricted at the throat, persistent, its lobes 4, spreading, deciduous. Petals none. Stamens (in ours) 2 or 4. Pistil 1. Achene enclosed in the 4-angled dry calyx.—Species about 30, north temperate zone. (Latin sanguis, blood, and sorbere, to absorb, the plant anciently a styptic.)

Stigmas cleft into narrow segments (brush-like).
  Leaflets incisely pinnatifid; fruiting calyx narrowly 4-winged, smooth or finely reticulate on the faces between the angles; annual........1. *S. annua.*
  Leaflets serrate; fruiting calyx 4-angled, irregularly and roughly thick-ridged and alveolate on the faces between the angles; perennial........2. *S. minor.*
Stigmas muricate-papillose; leaflets merely serrate; fruiting calyx 4-angled, with thick ridges and smooth intervening faces; perennial........3. *S. officinalis.*

1. **S. annua** Nutt. Western Burnet. Stem erect, branching at or near the base, 12 to 20 (or 24) inches high; leaflets 3 to 5 lines long, incisely parted into narrow lobes; spikes oblong, 4 to 6 (or 10) lines long; flowers 1 to 2 lines wide; calyx-lobes oval, mucronulate, scarious-margined.

Dry flats or moist meadows in the mountains, 2500 to 5500 feet: Cuyamaca Mts.; Nevada Co. to Modoc Co., thence west to Humboldt Co. North to British Columbia, east to Arkansas. June-July.

Locs.—Stonewall Mine, Cuyamaca Mts., San Diego Co., *Parish* 4418; Donner Lake, Nevada Co., *Heller* 6903; Mineral, Tehama Co., *Jepson* 12,337; Prattville, Plumas Co., *Jepson* 4133; Jess Valley, Warner Mts., *Jepson* 7957; Buck Creek, Warner Mts., *L. S. Smith* 936; Forestdale, sw. Modoc Co., *Nutting;* Sisson, Siskiyou Co., *Jepson* 13,862; Quartz Valley, Siskiyou Co., *Butler* 1468; Van Duzen River valley, opp. Buck Mt., Humboldt Co., *Tracy* 2816.

Refs.—Sanguisorba annua Nutt.; T. & G. Fl. 1:429 (1840); Jepson, Man. 501 (1925). *Poterium annuum* Nutt.; Hook. Fl. Bor. Am. 1:198 (1834), type loc. Red River, Ark., *Nuttall. Poteridium annuum* Spach, Ann. Sci. Nat. ser. 3, 5:43 (1846). *Sanguisorba occidentale* Nutt.; T. & G. l.c., type from Ore., *Nuttall. Poteridium occidentale* Rydb. N. Am. Fl. 22:388 (1908).

2. **S. minor** Scop. Garden Burnet. Stems erect, branched, leafy, several from a branched root-crown, 8 to 20 inches high; herbage glabrous or (especially below) sparsely pubescent; leaflets 6 to 10, orbicular, coarsely serrate, 4 to 6 lines long; heads subglobose or short-oblong, 5 lines long; flowers unisexual, the lower staminate, the upper pistillate, about 3 lines wide; bracts and bractlets ovate, ciliate; calyx-lobes oval, acute or apiculate, often purple-tinged; stamens and stigmas purplish, exserted.

European garden plant, occasionally cultivated and sparingly naturalized: Napa Range; San Francisco Co. May-June.

Locs.—St. Helena, *Jepson* 3007; Calistoga, *Crum* 813; San Francisco, *Greene.*

Refs.—Sanguisorba minor Scop. Fl. Carn. ed. 2, 1:110 (1772); Jepson, Man. 501 (1925). *Poterium sanguisorba* L. Sp. Pl. 994 (1753), type from Europe. *P. minus* S. F. Gray, Nat. Arr. Brit. Pl. 2:575 (1821).

3. **S. officinalis** L. Great Burnet. Stems erect, 2 to 3 feet high; herbage glabrous; leaflets roundish to ovate, cordate at base, serrate, 1 to 1¾ inches long; spikes short-cylindric, 6 to 11 lines long; flowers 2 to 2½ lines wide; calyx-lobes oval, dark purple.

Peat bogs near the coast, 50 to 4000 feet: Mendocino Co. to Del Norte Co. North to British Columbia. Europe, Asia. July-Sept.

Locs.—Albion, Mendocino Co., *Davy* 6080; Bald Mt., betw. High Prairie and Snow Camp, Humboldt Co., *Tracy* 4602; Gasquet, Del Norte Co., *M. S. Baker* 284.

Refs.—Sanguisorba officinalis L. Sp. Pl. 116 (1753), type from Europe; Jepson, Man. 501 (1925). *Poterium officinale* Gray, Proc. Am. Acad. 7:340 (1868). *S. microcephala* Presl, Epim. Bot. 202 (1849), type loc. Nootka Sound, *Haenke.*

19. ALCHEMILLA L.

Ours a diminutive annual herb, with palmately-lobed leaves and sheathing stipules. Flowers minute, greenish, pediceled and fascicled in the axils. Calyx pitcher-shaped, its lobes 4 or 5; bractlets 4 or 5, or sometimes minute or obsolete. Petals none. Stamens 1 to 4. Pistils 1 to 4 (in ours 1), distinct, the slender style lateral or arising from near the base. Achene ovate, smooth, concealed in the tube of the persistent calyx.—Species about 80, all continents, but mostly in the Andes from Chile north to Mexico. (So named because valued in alchemy.)

1. **A. arvensis** Scop. Lady's Mantle. Stems usually branched from the base, erect or ascending, 1 to 5 (or 9) inches long, the branches slender and flower-bearing throughout; herbage scantily soft-hairy; leaves fan-shaped, 3-parted, 2 to 3 lines long, the segments 2 or 3-cleft; calyx ½ to ⅔ line long.

Low hills and plains, 5 to 2500 feet: widely distributed in cismontane California. Naturalized from Europe. Mar.-May.

Locs.—Coast Ranges: Stone Lagoon, Humboldt Co., *Jepson* 9337a; Bridgeville, Humboldt Co., *Tracy* 7018; Mill Creek, Ukiah, *Jepson* 4010; Conn Valley, Napa Range, *Jepson* 10,314; Fairfax, Marin Co., *Bioletti;* Nortonville, Contra Costa Co., *Jepson* 15,722; Berkeley Hills, *Jepson* 9628; Arroyo Grande, San Luis Obispo Co., *Alice King.* Sierra Nevada: Rough and Ready, Nevada Co., *Jepson* 13,867; Auburn, *Bolander* 4541; Columbia, Tuolumne Co., *Jepson* 6299 (the last two spms. with larger calyx-lobes and densely pilose calyx-tube representing Aphanes macrosepala Rydb.); Jackson, Amador Co., *Hansen;* Mariposa Co. foothills (Zoe 3:28). S. Cal.: Mission La Purisima, Santa Barbara Co., *Jepson* 11,942; Prisoners Harbor, Santa Cruz Isl., *Mabel Peirson;* Santa Ynez Mts., *T. Brandegee;* Santa Catalina Isl., *Davidson;* San Bernardino Valley, *Parish* 6813; San Diego, *T. Brandegee.*

Refs.—ALCHEMILLA ARVENSIS Scop. Fl. Carn. ed. 2, 1:115 (1772); Greene, Fl. Fr. 62; Jepson, Fl. W. Mid. Cal. 284 (1901), ed. 2, 211 (1911), Man. 502, fig. 498 (1925). *Aphanes arvensis* L. Sp. Pl. 123 (1753), type from Europe. *Alchemilla cuneifolia* Nutt.; T. & G. Fl. 1:432 (1840), type loc. Santa Barbara, *Nuttall. Aphanes cuneifolia* Rydb. N. Am. Fl. 22:380 (1908). *A. macrosepala* Rydb. l.c., type loc. Wimer, Ore., *E. W. Hammond* 116. *Alchemilla arvensis* var. *glabra* Greene, Fl. Fr. 62 (1891), type loc. Sacramento Valley.

20. CERCOCARPUS HBK. MOUNTAIN MAHOGANY

Evergreen shrubs or low trees with spur-like branchlets and simple coriaceous straight-veined leaves. Flowers from winter buds, solitary or fascicled, terminal on the short branchlets. Calyx consisting of a slender pedicel-like tube abruptly expanded near the summit into a low-hemispherical cup, its lobes 5, small, these and the cup deciduous from the persistent tube. Petals none. Stamens numerous, borne in two or three rows on the calyx-cup. Pistil 1. Fruit a villous achene enclosed in the persistent calyx-tube and surmounted by the very much elongated twisted soft-hairy style.—Species 6, western North America. (Greek kerkis, a shuttle, and karpos, fruit, in reference to the achene and its twisted tail.)

Bibliog.—Schneider, C. K. Beitrag zur Kenntnis der Arten und Formen der Gattung Cercocarpus Kunth (Mitt. Deutsch. Dendrol. Gesellsch. 14:125–129,—1905). Rydberg, P. A., Cercocarpus (Bull. Torr. Club 41:497–503,—1914).

Flowers solitary or rarely in pairs, sessile; desert ranges.
  Leaves narrowly lanceolate, ½ to 1 inch long........1. *C. ledifolius.*
  Leaves oblong, 2½ to 5 lines long........2. *C. intricatus.*
Flowers in 2 to 15-flowered clusters, shortly pedicelled.
  Leaves obovate, cuneate at base; clusters commonly 2 or 3-flowered.
    Flowers 3 lines broad; cismontane, abundant........3. *C. betuloides.*
    Flowers 1 to 1½ lines broad; San Diego Co........4. *C. minutiflorus.*
  Leaves ovate to elliptic; clusters 4 to 9-flowered; Santa Barbara Isls.
    Leaves glabrous or nearly so........5. *C. alnifolius.*
    Leaves white-tomentose beneath........6. *C. traskiae.*

1. **C. ledifolius** Nutt. DESERT MAHOGANY. CURL-LEAF MAHOGANY. Shrub or scraggy tree, usually 6 to 20 or sometimes 40 feet high; leaf-blades narrowly lanceolate, entire with revolute margins, coriaceous, pale or rusty-pubescent below, becoming glabrous and lustrous above, somewhat resinous, ½ to 1 inch long, with a prominent midrib; calyx-tube in fruit 4 to 5 lines long, sessile; tail of achene 2 to 3 inches long.

Arid slopes, flats, plateaux and cañon walls of ranges in and bordering the deserts or arid interior, 4000 to 8600 feet: San Jacinto, San Bernardino and San Gabriel mountains; Mt. Pinos; easterly summits and east slopes of the Sierra Nevada from Kern Co. to Modoc Co., thence west to Siskiyou Co. North to Washington, east to Colorado. July-Aug.

Field note.—Cercocarpus ledifolius is one of the more important woody species in the desert ranges. In the White Mts. it occurs as pure well-developed colonies on the open slopes below the Pinus flexilis belt. These colonies consist of shrubs averaging 7 to 10 feet high, the trunks mostly 8 to 12 inches in diameter at the ground, branching at or near the ground into many stems. In Silver Cañon it colonizes broad bands up and down the walls, conforming to the blue rock, or where the walls, 1500 to 2000 feet high, are almost vertical it finds a favorite habitat on the ledges.

On the abrupt east wall of the Sierra Nevada this species forms a belt between the altitudes 5000 and 8000 feet on the average. Individuals in this belt are frequently arboreous. Near

Timosea Peak an individual 13 feet 9 inches high with a crown width of 33 feet had (in 1912) a trunk diameter of 30 inches at the ground; the trunk forked at 3 feet, one limb being 1 foot 1 inch in diameter, another 1 foot 2⅓ inches in diameter. On a rocky ridge near Heart Lake, western Inyo Co., it has been noted at 10,500 feet (*Peirson* 9470).

The wood is very hard, very heavy, remarkably close-grained and lends itself to the finest turning under a lathe, being susceptible of treatment that is akin to that given iron or copper. Mechanics have for it a great admiration. It is much used to stoke furnaces at desert mines, though artisans voice resentment that so remarkable a wood, occurring in comparatively limited quantities, should be used for such a purpose. The wood is so hard that it is sometimes used for engine bearings.

Locs.—San Jacinto Mts. (Univ. Cal. Publ. Bot. 1:85); Cienega Seca Creek, San Bernardino Mts., *Munz* 6310; Snow Cañon, San Bernardino Mts., *Jepson;* Mt. Wilson, San Gabriel Mts., *Peirson* 79; Telescope Peak, Panamint Range, *Jepson* 7020; upper Kern Cañon, opp. Whitney Creek, *Jepson;* Timosea Peak, Inyo Co., *Jepson* 5080; Kearsarge Mill to Rex Montis Mine, Inyo Co., *Jepson* 891; Silver Cañon, White Mts., *Jepson* 7224; Convict Lake, Mono Co., *Almeda Nordyke;* Bloody Cañon, Mono Co., *Jepson;* Leevining Cañon, Mono Co., *Ottley* 1080; betw. Deadman Creek and Sonora Pass, *A. L. Grant* 152; Independence Lake, *R. H. Platt;* Susanville (mts. ne.), *Jepson;* upper Fall River Valley, ne. Shasta Co., *Jepson;* Davis Creek, Modoc Co., *Jepson;* Fandango Pass, Warner Mts., *Jepson;* Mt. Bidwell, Warner Mts., *Manning;* betw. Mountain Home and Gazelle, Siskiyou Co., *Jepson;* Yreka, *Butler* 1166.

Refs.—CERCOCARPUS LEDIFOLIUS Nutt.; T. & G. Fl. 1:427 (1840), type loc. "Rocky Mountains, in alpine situations on the summits of the hills of Bear River of Timpanagos" (Bear River, Idaho), *Nuttall;* Jepson, Man. 502 (1925). *C. ledifolius* var. *intercedens* f. *subglabra* C. K. Schn. Mitt. Deutsch. Dendr. Ges. 14:128 (1905), type loc. Slate Cañon, Provo, Utah, *Jones* 5615.

2. **C. intricatus** Wats. SMALL-LEAF MAHOGANY. Intricately branched spinescent shrub 2 to 5 feet high; leaf-blades oblong, dark green and nearly glabrous above, white-pubescent beneath, strongly revolute, the sides nearly meeting under the midrib, 2½ to 5 lines long; calyx-tube tomentulose, 2 to 3 lines long; tail of achene ¾ to 1¼ inches long.

Desert ranges, 5000 to 7000, rarely to 9800 feet: White Mts.; Panamint Range; Providence Mts. East to Utah. May, fr. July-Aug.

Locs.—Silver Cañon, White Mts., *Jepson* 7415; Death Valley Cañon, Panamint Range (Contrib. U. S. Nat. Herb. 4:94); Providence Mts., *T. Brandegee.* Nevada: Miller Mt., Mineral Co., *Shockley* 215; Lee Cañon, Charleston Mts., *Heller* 11,047.

Refs.—CERCOCARPUS INTRICATUS Wats. Proc. Am. Acad. 10:346 (1875); Cary, N. Am. Fauna 42:68, pl. 15 (1917); Jepson, Man. 502 (1925). *C. breviflorus* Wats. Bot. King 83 (1871), type loc. American Fork Cañon of the Wasatch Mts., Utah, *Watson* 314; not C. breviflorus Gray (1853). *C. ledifolius* var. *intricatus* Jones, Zoe 2:14 (1891), 3:298 (1893). *C. intricatus* var. *typicus* C. K. Schn. Mitt. Deutsch. Dendr. Ges. 14:129 (1905).

3. **C. betuloides** Nutt. CALIFORNIA HARD-TACK. Spreading or erect shrub 5 to 8 feet high, or a small tree up to 22 feet high; leaf-blades obovate, serrate above the middle, cuneate and entire towards the base, conspicuously feather-veined, dark green above, pale or whitish-pubescent beneath, not resinous, ½ to 1 (or rarely 2) inches long; clusters 2 or 3-flowered; flowers 3 lines broad; calyx strigulose-pubescent; calyx-tube in fruit reddish, 6 lines long, borne on a pedicel 1 to 4 lines long; tail of achene 2 to 3 (or 4) inches long.

Dry slopes, flats or ridges, in the foothills and mountains, 250 to 5000 feet, throughout cismontane California. North to Oregon, east to the Rocky Mts., south to Lower California. Apr.-June.

Field note.—Cercocarpus betuloides is an important constituent of the hard chaparral formation throughout the Coast Ranges, Sierra Nevada and mountains of the cismontane area in Southern California. It rarely forms pure colonies in even a limited way but is sometimes dominant in restricted areas. It crown-sprouts with marked vigor after chaparral fires, and, most interestingly, without the intervention of fire it crown-sprouts, often freely, on the advance of extreme senility. It is almost never truly arboreous, though it often becomes 16 to 20 or even 28 feet high (as on Grouse Creek in Tulare Co.), yet commonly retaining the aspect, form and habit of individuals one-third the height or less. On Santa Catalina Island Blanche Trask records extreme heights of "forty feet" (Erythea 7:138). In the very tall chaparral on the South Fork Kaweah River it is forced up to heights of 15 to 22 feet, forming slender somewhat tree-like poles, with the trunks 5 to 7 inches in diameter near the ground. However, even such tall specimens do not mature a definite tree type or arboreous form. Its reduced leaves and dense wood are evidences of its adaptation to the hard chaparral formation. The seed, with its dense coat (fig. 167), is also an adaptation to the chaparral xeric and fire conditions. The leaves vary little in shape and as a rule not very markedly in size. Most commonly they are ½ to 1 inch long. In very rocky situations shrubs may bear small leaves 3 to 5 lines long (Howell Mt., *Jepson* 6583), or at higher altitudes in good soil shrubs may bear leaves ½ to 1 or even 2 inches long (Santa Barbara, *Parish* 11,037; Rowen, Tehachapi Mts., *Jepson* 6739). Crown sprouts produce leafy shoots with leaves often 1 to 1¾ inches long. Such leaves are often sub-orbicular, a character which is sometimes reflected in the adult shrub (cf. the form segregate C. rotundifolius Rydb.). Leaf variation is, however, much less than might be expected from the wide geographic range of the species and the diversity in habitat. On moist north slopes in dense stands very erect individuals may develop, so that, as in the Kaweah River region, the mountaineers secure straight sticks as much as 13 feet long and 3 to 4 inches thick which are used for building purposes. The herbage is browsed by cattle and deer take the young shoots. As a browse shrub the mountaineers call it Sweet Brush or Birch-leaf Mahogany, while the name Mountain Ironwood is given it on account of the hard dense wood.

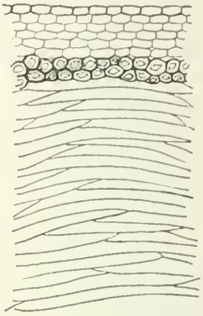

Fig. 167. CERCOCARPUS BETULOIDES Nutt.; cross sect. of seed coat, × 120.

Locs.—S. Cal.: La Costa Creek, Campo, San Diego Co., *Parish* 19,319; Dulzura, San Diego Co., *Parish* 10,821; Palomar Mt., *Munz* 10,418; Santa Rosa village, Santa Rosa Mts., *Munz* 5925; Pipe Creek, Riverside Co., *C. B. Wolf* 1950; San Bernardino foothills, *Parish;* Cajon Cañon, *Jepson;* San Gabriel Mts., *Peirson* 340; Topango Cañon, Santa Monica Mts., *Epling & Ellison;* Santa Barbara, *Parish* 11,037; Purisima Hills, n. Santa Barbara Co., *Jepson* 11,947a; San Emigdio Cañon, sw. Kern Co., *Davy* 2017. Coast Ranges: Cantua Creek, e. Fresno Co., *S. C. Lillis;* Santa Lucia Creek, Santa Lucia Mts., *Jepson* 4727; Lorenzo Creek, upper San Benito River, *Julia A. Bettys;* Loma Prieta, Santa Cruz Mts., *Davy* 677; Saratoga, Santa Clara Co., *Jepson* 5631; Cedar Mt., Mt. Hamilton Range, *Jepson;* Mt. Diablo, *Jepson* 9083; Howell Mt., Napa Co., *Jepson* 6583; Gates Cañon, Vaca Mts., *Jepson* 13,869; Indian Valley, ne. Lake Co., *Jepson;* Alder Sprs. (10 mi. e.), Glenn Co., *Heller* 11,456; betw. Nobles ranch and Dyers ranch, New River, Trinity Co., *Jepson;* Hayfork Mt., Trinity Co., *Tracy* 6431; Oro Fino, Siskiyou Co., *Butler* 672. Tehachapi Mts.: near Double Mt., *Jepson* 7429; Rowen, *Jepson* 6739; Bear Mt., *Jepson.* Sierra Nevada: Nelson, Middle Fork Tule River, *Jepson;* North Fork Tule River above Milo, *Jepson;* North Fork Kaweah River, *Jepson;* Whipstock Flat near Badger, *Jepson;* Hetch-Hetchy, *Jepson;* Columbia, Tuolumne Co., *A. L. Grant* 631; Shady Creek, near South Yuba River, acc. *L. S. Smith;* Forestdale, sw. Modoc Co., *M. S. Baker.*

Var. **macrourus** Jepson. Leaves 1¼ to 2¼ inches long; calyx tomentulose.—Rocky slopes or lava beds, 4000 to 4500 feet: Siskiyou Co. to Modoc Co. On the lava beds it occurs in scattered but dense small colonies.

Locs.—Shackelford Cañon, w. Siskiyou Co., *Jepson* 2810; Shasta River, Yreka, Siskiyou Co., *Butler* 286; Egg Lake (lava beds n.), Modoc Co., *L. S. Smith* 1367.

Var. **multiflorus** Jepson. Leaves 1 to 1½ inches long; flowers 5 to 15 in a cluster.—Santa Catalina Isl.; Santa Ana Mts. (Claymine Cañon, *J. T. Howell* 2612); San Gabriel Mts. (Mt. Wilson, *C. E. Hutchinson,* Fish Cañon, *Peirson* 340a).

Refs.—CERCOCARPUS BETULOIDES Nutt.; T. & G. Fl. 1:427 (June, 1840), type loc. "mountains of Santa Barbara," *Nuttall;* Jepson, Man. 502, fig. 499 (1925). *C. betulaefolius* Nutt.; Hook. Icon. Pl. 322 (Oct., 1840); Jepson, Fl. W. Mid. Cal. 278 (1901). *C. parvifolius* Nutt.; H. & A. Bot. Beech. 337 (1840), type loc. "Rocky Mts. in bushy ravines near the sources of the Platte" (River), *James, Nuttall;* Jepson, Fl. W. Mid. Cal. ed. 2, 205 (1911). *C. parvifolius* var. *glaber* Wats. Bot. Cal. 1:175 (1876). *C. parvifolius* var. *betuloides* Sarg. Silva 4:66 (1892). *C. betulaefolius* var. *typicus* C. K. Schn. Handb. Laubh. 1:531 (1905). *C. betulaefolius* var. *typicus* f. *glabrescens* C. K. Schn. l.c. *C. betulaefolius* var. *minor* C. K. Schn. l.c. (leaves under 5 lines long). *C. betulaefolius* var. *blancheae* C. K. Schn. Mitt. Deutsch. Dendr. Ges. 14:127 (1905) in part. *C. douglasii* Rydb. N. Am. Fl. 22:421 (1913), type from Cal., *Douglas. C. rotundifolius* Rydb. l.c., type loc. Los Angeles Co., *Geo. B. Grant* 3488 (leaves broadly oval to suborbicular). Var. MACROURUS Jepson, Man. 503 (1925). *C. macrourus* Rydb. N. Am. Fl. 22:420 (1913), type loc. Modoc Co., *M. S. Baker.* Var. MULTIFLORUS Jepson, Man. 503 (1925), type loc. Avalon, Santa Catalina Isl., *Jepson* 3041.

4. **C. minutiflorus** Abrams. MESA HARD-TACK. Similar to C. betuloides; leaf-blades elliptic, serrate near the apex, 6 to 10 lines long, glabrous on both sides, green above, yellowish beneath; flowers 1 to 1½ lines broad.

Rocky hills and mesas, 2000 to 3000 feet: southern San Diego Co. Lower California.

Locs.—Campo, *Parish* 19,318; betw. Cottonwood Creek and Potrero, *J. T. Howell* 2971.

Refs.—CERCOCARPUS MINUTIFLORUS Abrams, Bull. Torr. Club 37:149 (1910), type loc. hills near San Dieguito (Bernardo), San Diego Co., *Abrams* 3376; Jepson, Man. 503 (1925).

5. **C. alnifolius** Rydb. Very similar to variants of C. betuloides and perhaps of no more than varietal rank; shrub or small tree, 8 to 16 feet high; leaf-blades elliptic, serrate above the base, subglabrate, 1 to 2 inches long; pedicels 3 to 5 lines long.

Dry hill slopes, 100 to 2000 feet: Santa Catalina and Santa Cruz islands. Mar., fr. July-Sept.

Locs.—Descanso Cañon, Santa Catalina Isl., *Parish* 10,752; Pelican Bay, Santa Cruz Isl., *Mason* 4108; Prisoners Harbor, Santa Cruz Isl., *Jepson* 12,059.

Refs.—CERCOCARPUS ALNIFOLIUS Rydb. N. Am. Fl. 22:421 (1913), type loc. Avalon, Santa Catalina Isl., *Trask;* Jepson, Man. 503 (1925). *C. betulaefolius* var. *blancheae* C. K. Schn. Mitt. Deutsch. Dendr. Ges. 14:127 (1905), mainly.

6. **C. traskiae** Eastw. CATALINA HARD-TACK. Shrub or small tree 8 to 20 feet high; leaf-blades elliptic to suborbicular or broadly ovate, serrulate towards apex, mostly obtuse, 7/8 to 2 inches long on petioles 2 to 5 lines long, densely white-woolly beneath, green and minutely pubescent above or at length glabrate, the parallel side-nerves prominent, the margin revolute in age; flowers 4 to 9 in a cluster; calyx-tube densely white-woolly, 4 to 5 lines long; calyx 4 lines wide; pedicels 1 to 3 lines long; tail of achene 2 to 2¼ inches long.

Dry arroyo, south side of Santa Catalina Isl. Mar., fr. Aug.

Historical note.—Cercocarpus traskiae is an insular endemic remarkable for its extremely localized habitat. It is known on Santa Catalina Island only from the single locality, Salte Verde, where it has been collected only by Blanche Trask. The living individuals are few in number. Under date of Sept. 4, 1909, the collector wrote from Avalon: "I am sending seed and fruiting specimens of my tree which I was fortunate in finding in the best of condition on the finest *living* tree. Notwithstanding the awful heat I came and went from August 24th to the 27th, tramping by the light of the moon, not venturing to risk the day for crossing the island" (Jepson Corr. 31:41, ms.). The flowers are mostly perfect but an occasional flower is wholly destitute of a pistil. The term andro-monoecious thus properly describes the sexual condition.

Refs.—CERCOCARPUS TRASKIAE Eastw. Proc. Cal. Acad. ser. 3, 1:136, pl. 11, figs. 7a-e (1898), type loc. Salte Verde, Santa Catalina Isl., *Blanche Trask;* Jepson, Man. 503 (1925).

21. ADENOSTOMA H. & A.

Evergreen shrubs with somewhat resinous herbage and heath-like foliage. Leaves fascicled, sometimes scattered and alternate, linear, rigid, entire, small and numerous. Flowers small (1½ to 2 lines wide), white, crowded on the branches of a terminal and rather close pyramidal panicle. Calyx obconical, 5-lobed, 10-striate. Stamens 10 to 15, inserted 2 or 3 together, alternate with the broad spreading petals. Pistil 1. Fruit an achene, covered by the indurated calyx-tube.—Species 2, California and Lower California. (Greek aden, gland, and stoma, mouth, in allusion to the calyx.)

Leaves fascicled; flowers sessile........1. *A. fasciculatum.*
Leaves not fascicled; flowers pediceled........2. *A. sparsifolium.*

1. **A. fasciculatum** H. & A. CHAMISE. CALIFORNIA GREASEWOOD. Spreading shrub 2 to 10 feet high, with virgate branches clothed with leaf-fascicles; old bark grayish- or reddish-brown, shreddy; leaves linear or rather broader towards the apex, 3 to 5 lines long; stipules minute; bracts herbaceous, much shorter than the strongly ribbed calyx; stamens equaling the orbicular petals; ovary obliquely truncate.

Mountain slopes and ridges, mesas and plains, 10 to 5000 feet: cismontane California. South into Lower California. May-July.

Field note.—Of California native shrubs occurring in large part in pure formations Adenostoma fasciculatum is the most abundant and widespread bush in the higher foothills of cismontane California. It is a marked feature of the mesas and extremely steep hillsides of coastal Southern California, where it is the "Greasewood" of the people, and it is equally characteristic of mountain slopes and cañons in the Coast Ranges. In the South Coast Ranges it often inhabits bluffs or headlands directly facing the sea, thence extending into the driest of the innermost Coast Ranges and forming large colonies on abrupt hillslopes, on gravelly flats of arid valleys or on well-drained detrital valley fans. In the North Coast Ranges it is likewise found from the coastal bluffs east to the inner Coast Range foothills, sometimes pressing closely upon the margins of the main Redwood belt or even invading locally favorable territory in the heart of the belt. It may, again, occupy steep mountain sides, the flood fans on valley levels or the tilted or hori-

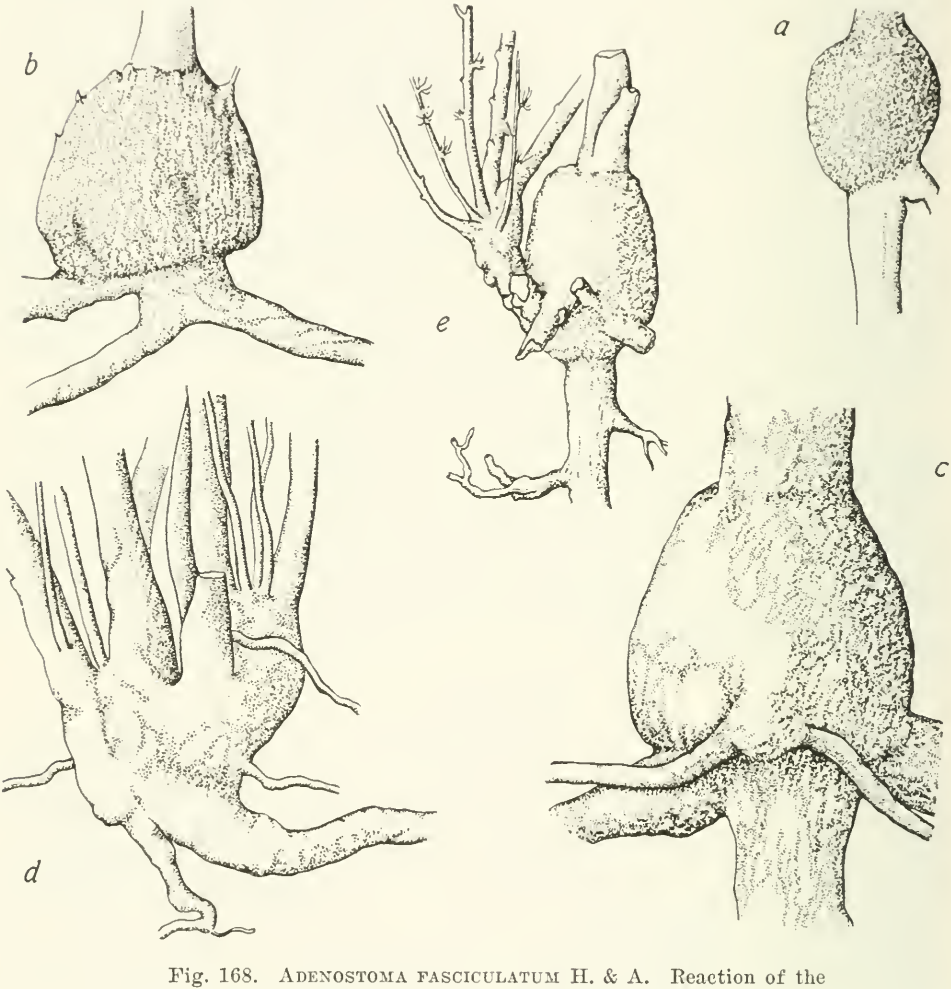

Fig. 168. Adenostoma fasciculatum H. & A. Reaction of the root-crown to chaparral fires: *a*, bulbous enlargement of the crown in a seedling about 7 years old, × 1. *b*, *c*, *d*, *e*, successive stages up to about 21 years, the fire interval about 6 to 9 years, × ½. Adam and Eve Ridge, Howell Mt., Napa County. 1915.

zontal floors of gravelly plains where perfection of drainage gives it a secure foothold. It is, however, absent from broad areas of barren hills in the Coast Ranges, perhaps by excess of soil water at critical periods or by lack of drainage. In the Sierra Nevada foothills it occurs at many stations and often in a characteristic pure formation as on the East Fork Kaweah River. There are, however, broad gaps in its distribution in the Sierra Nevada foothills, where it appears either infrequent, localized or absent such as: between Fresno River and the North Fork Kings River, where it is replaced by Eriodictyon californicum Greene; Shasta Co. to Eldorado Co. It has not been recorded from the Tehachapi Mts.

Chamise is commonly gregarious and often forms a distinct chamisal belt between the chaparral belt of the low foothills and the Western Yellow Pine belt above. The purest and most extensive formations are often those occurring on the steepest and driest south and west slopes. Such marked belts occur frequently on the westerly slope of the sierran axis in Southern California and are a part of the dramatic vegetation content of the country in the Kaweah River region of the southern Sierra Nevada and in the Greasewood Hills region, in western Tehama Co., inner North Coast Range. Yet again, as a further example: the east slope of the inner range of the Santa Lucia Mts. from Salinas south to the Arroyo Seco, is striped by a narrow Chamise band. This band occupies both of the local slopes of the narrow deep cañons, or if the right hand slope lies directly north the Chamise band is replaced by chaparral. As the band runs southward it becomes broader and more uniform on both local slopes, or if the slope have a swale or flat in it low oak or chaparral replaces Chamise. Such extensive pure colonies are known as chamisal. In cismontane California the geographic name Black Hills has its origin in pure formations of Adenostoma fasciculatum, likewise the name Greasewood Hills. On the other hand this species also occurs very commonly as scattered individuals through the hard chaparral as an associate of Ceanothus cuneatus, C. leucodermis, Arctostaphylos manzanita, A. viscida, A. mariposa and many other frutescent species. It has a wider ranger and is more abundant in individuals than any other shrub species in California save only Rhus diversiloba T. & G. None other of our shrubs of wide range, however, equals it in constancy of character.

The individual is well-protected against completely destructive effects of chaparral fires by its strong taproot which descends vertically to a depth of 3 to 8 feet or more wherever the subsoil conditions permit. Strong lateral roots are also developed. After fire the plant regenerates by shoots from the root-crown. Under repeated fires the root-crown increases in size and usually becomes an enlarged woody structure 2 to 6 inches in diameter. A strong taproot is first established by the seedling. After about 6 or 8 years (cf. fig. 168) a thickening occurs at base of the stem a little below but mostly above the surface of the ground which becomes turnip- or bulb-shaped, higher than broad, but sometimes globose. As the years pass extra shoots arise from this bulb and the bulb-shaped base is eventually replaced by a more or less irregular and heavy bulbous structure or root-crown. The younger plants with bulb-like bases seldom survive heavy fires, but the older shrubs in the main offer effective resistance. After the Mt. Tamalpais fire of 1913, Adenostoma fasciculatum made crown-sprouts at a time when some other markedly virile species, such as Arctostaphylos glandulosa Eastw. and Quercus wislizenii var. frutescens Engelm., failed to do so. It seems probable that mature Chamise is rarely or never completely killed even by repetition of running chaparral fires recurring at short intervals.

Locs.—Coast Ranges: Blue Rock ridge, nw. Mendocino Co., *Jepson;* Comptche, Mendocino Co., *H. A. Walker* 390; Houghs Sprs., ne. Lake Co., *Jepson;* betw. Adams Sprs. and Glenbrook, Lake Co., *Jepson;* Howell Mt., Napa Range, *Jepson* 6584; Vaca Mts., *Jepson* 13,832; Inverness, Marin Co., *Jepson;* Rattlesnake Camp, Mt. Tamalpais, *A. L. Grant;* Moraga Ridge, Contra Costa Co., *Jepson;* Mt. Diablo, *Jepson;* Saratoga, Santa Cruz Mts., *Jepson* 5632; Del Monte, Monterey Co., *Jepson* 9760; Big Sur River, *Jepson;* San Antonio trail, Santa Lucia Mts., *Jepson;* Waltham Creek, sw. Fresno Co., *Jepson.* Sacramento Valley: College City, *Alice King.* Sierra Nevada foothills: North Fork American River, s. of Applegate, Placer Co., acc. *L. S. Smith;* Forest Hill divide, Placer Co., *L. S. Smith;* Buena Vista, Amador Co., *Jepson* 9967; Gwin Mine, Calaveras Co., *Jepson;* Parrots Ferry, Stanislaus River, *Jepson;* North Fork Kaweah River, *Jepson;* Middle Tule River, *Purpus* 5581. S. Cal.: Liebre Mts., *Munz* 7056a; Santa Inez Mts., *Jepson;* Santa Cruz Isl., *Jepson* 12,092; Ojai Valley, *Olive Thacher;* Mt. Wilson, *Peirson* 78; San Bernardino foothills, *Parish;* Swain Cañon, Santa Catalina Isl., *Jepson;* Cahuilla Valley, sw. Riverside Co., *Jepson;* Palomar Mt., *Jepson;* San Pasqual grade, San Diego Co., *Jepson* 8507; Santa Ysabel, San Diego Co., *Jepson.*

Var. **obtusifolium** Wats. Leaves blunt, 2 to 3 lines long, sessile or very short-petioled.—Western San Diego Co. Northern Lower California. The following with very short-petioled leaves are intermediate toward the species: Santa Rosa Isl., *T. Brandegee;* San Diego, *H. P. Kelley;* Howell Mt., Napa Co., *Tracy* 2230 (probably an independent mutant).

Refs.—ADENOSTOMA FASCICULATUM H. & A. Bot. Beech. 139, t. 30 (1832), type loc. "sandy plains, Bay of Monterey"; Jepson, Fl. W. Mid. Cal. 277 (1901), ed. 2, 205 (1911), Man. 503, fig. 500 (1925). *A. fasciculatum* var. *densifolium* Eastw. Bull. Torr. Club 32:199 (1905), type loc. Mt. Wilson, near Pasadena, *Fordyce Grinnell Jr. A. californicum* Gandg. Bull. Soc. Bot. France 59:707 (1912), type loc. San Bernardino, *Parish* 4838. Var. OBTUSIFOLIUM Wats. Bot. Cal. 1:184

(1876), type loc. San Diego, *Nuttall;* Jepson, Man. 503 (1925). *A. brevifolia* Nutt.; T. & G. Fl. 1:430 (1840). *A. fasciculatum* var. *hirsutum* C. K. Schn. Handb. Laubh. 1:533 (1905). *A. laxum* Gandg., l.c., type loc. San Diego, *Brandegee* 1642.

2. **A. sparsifolium** Torr. RIBBON WOOD. YERBA DEL PASMO. Shrub of thin and slender habit, 10 to 15 feet high; old bark red, shredding off freely in thin sheets; foliage-bearing branchlets clustered at the end of the branches; branchlets and leaves glandular-dotted; leaves alternate, linear, 3 to 5 lines long; stipules none; bracts scarious, exceeding the obscurely ribbed calyx; stamens shorter than the elliptic petals; ovary truncate.

Mountain slopes and mesas, 2500 to 6000 feet: Santa Barbara Co. to San Diego Co. South to Lower California. July-Aug. Also called Red Shanks.

Locs.—Cuyama Valley, acc. *Ralph Hoffmann;* Tepesquet Creek, Santa Barbara Co., *Wieslander;* Topango Cañon, Santa Monica Mts. (Dav. & Mox. Fl. S. Cal. 179); Chalk Hill, San Jacinto Mt., *Jepson* 2284; Hemet, Riverside Co., *B. Moses;* Palomar Mt., *J. P. Harrington;* Hot Springs Mt., San Diego Co., *Jepson;* Cuyamaca Mts., *Palmer;* Campo, n. of, on Buckman Sprs. road, s. San Diego Co., *J. T. Howell* 2978; Pine Valley, San Diego, *Orcutt.*

Refs.—ADENOSTOMA SPARSIFOLIUM Torr.; Emory, Notes Mil. Rec. 140 (1848), type loc. "Cordilleras of California" (that is, mts. of eastern San Diego Co.), *Emory;* Jepson, Man. 503 (1925).

22. COLEOGYNE Torr.

Widely, densely, and intricately branched spinescent shrub. Leaves opposite, small, entire, coriaceous. Flowers solitary, terminal on short branchlets and subtended by 1 or 2 pairs of 3-lobed bracts. Calyx-tube almost none. Calyx-lobes 4, large, yellowish within, persistent. Petals none. Stamens 20 to 40, inserted externally upon the lower part of a tubular sheath or torus which encloses the ovary. Pistil 1; style lateral, conspicuously and densely villous at base, twisted, exserted, persistent. Fruit a coriaceous glabrous achene.—Species 1. (Greek koleos, sheath, scabbard, and gune, ovary.)

1. **C. ramosissima** Torr. BLACK BUSH. One to 5 feet high; branches opposite; leaves fascicled or approximate, thick, linear-oblanceolate, canescent, 2 to 4 lines long; stipules short-lanceolate or subtriangular, persistent after leaf fall; calyx-lobes 4 lines long, the two outer ovate to lanceolate, acute, the two inner broader, ovate or obovate, abruptly short-mucronate; torus membranous, dilated below, 5-toothed at apex, as long as the calyx, glabrous outside, densely villous within.

Sandy or gravelly slopes in desert ranges, 1000 to 4500 feet: western Colorado Desert; eastern Mohave Desert; Inyo Co. East to Colorado. Apr.-Aug.

Locs.—Colorado Desert, west side: San Felipe Valley, e. San Diego Co., *Jepson* 12,446; Morongo Valley, *J. T. Howell* 2891; White Tanks, w. of Pinto Basin, n. Colorado Desert, *Jepson* 12,623. Mohave Desert: Cushenbury Sprs., *Parish* 1268; Ord Mt., *Jepson* 5869; Granite Wells, acc. *Peirson;* Kessler Peak, Ivanpah Mts., *Jepson* 15,834. Inyo Co.: Emigrant Cañon, Panamint Range, *Jepson* 7123.

Refs.—COLEOGYNE RAMOSISSIMA Torr. Pl. Frem. 8, pl. 4 (1853), "sources of the Mohave and Virgin Rivers, * * * in the mountains of Southern California," *Fremont;* Jepson, Man. 504, fig. 501 (1925).

23. PURSHIA DC.

Shrubs. Leaves mostly fascicled, the blades cuneate, 3-toothed or -lobed, with revolute margins. Flowers solitary, terminal on the short branches. Petals clawed, exceeding the calyx-lobes, pale yellow or white. Stamens 18 to 25, in one row. Pistil 1. Fruit a coriaceous oblong pubescent achene, exserted and attenuate into the persistent style.—Species 2, western North America. (F. T. Pursh, 1774–1820, author of the Flora Americae Septentrionalis.)

Leaves without punctate glands, apparently deciduous	1. *P. tridentata.*
Leaves with punctate glands, apparently evergreen	2. *P. glandulosa.*

1. **P. tridentata** DC. ANTELOPE BRUSH. Diffusely branched silvery or gray shrub 1½ to 10 feet high; bark gray or brown; leaf-blades cuneate, 3-toothed at apex, thinly pubescent and green above, white-pubescent below, 3 to 8 lines long; calyx pubescent, thickly sprinkled with resin granules; calyx-lobes pubescent; petals pale yellow, obovate, 3 to 5 lines long, filmy.

Arid slopes and dry valleys, 4000 to 7000 (or rarely 11,000) feet: east slope and east Summit valleys of the Sierra Nevada from Tulare and Inyo Cos. to Modoc Co., thence west to northern Trinity Co. East to the Rocky Mts., north to Oregon. May-Aug.

Field note.—The bushes of Purshia tridentata often consist of several or many stems from the base. The light brown bark is very shreddy; on the younger branches it is smooth and is reminiscent of peach or plum bark. In Lassen Co. the bush is a valued winter forage when snow is on the ground, since cattle and sheep browse the shoots of the past season. It is also called Bitter-brush, Greasewood and Buck-brush.

Locs.—Little Kern River, near Trout Mdws., *Jepson* 4916; Green Lake, w. Inyo Co., acc. *Peirson* (nearly prostrate); Bloody Cañon, Mono Co., *Chesnut & Drew;* Fales Hot Sprs., Alpine Co., *Ottley* 1034; Brockway, Lake Tahoe, *Jepson* 7741; Truckee, *L. S. Smith;* Loyalton, Sierra Co., *L. S. Smith;* Cherry Peak, Plumas Co., acc. *W. I. Follett;* Long Valley, Lassen Co., *Jepson;* Honey Lake Valley, *Jepson;* Hot Springs Valley, Lassen Peak, *Jepson* 4076; Davis Creek, Modoc Co., *Jepson* 7831; upper Fall River Valley (lava fields ne.), *Jepson;* McCloud, *Jepson;* Sisson, Mt. Shasta, *Jepson* 13,843; Yreka, *Butler* 285; Salmon Mts., Trinity Co., *Hall* 8651.

Refs.—PURSHIA TRIDENTATA DC. Trans. Linn. Soc. 12:158 (1818); Hook. Fl. Bor. Am. 1:170, pl. 58 (1834); Lindl. Bot. Reg. t. 1446 (1831); Jepson, Man. 504, fig. 502 (1925). *Tigarea tridentata* Pursh, Fl. 333 (1814), "prairies of the Rocky Mts." (Montana), *Lewis. Kunzia tridentata* Spr. Sys. 2:475 (1825).

2. **P. glandulosa** Curran. Dark green shrub 2 to 4 (or 8) feet high; bark dark red or gray; leaf-blades divided above into 3 (rarely 5) linear lobes, or sometimes merely 3-toothed, narrowed below to a petiole-like base, nearly glabrous, 2 to 4½ lines long, the revolute margin with conspicuous glandular dots or pustules; petals white; calyx and fruit canescent.

Desert slopes or arid flats, 4000 to 9000 feet: mountains on west side of Colorado Desert; Mohave Desert; Inyo and Mono Cos. East to Nevada. Apr.-July.

Field note.—In the White Mts. Purshia glandulosa grows 1 to 3 feet high and twice as broad, forming low broad bushes in the open Hickory Pine (Pinus aristata) forest, producing an effect similar to that of Snow Brush (Ceanothus cordulatus) in the higher Sierra Nevada coniferous forest.

Locs.—Live Oak Sprs., s. San Diego Co., *Jepson* 11,830; Kenworthy, San Jacinto Mts., *Munz* 5499; Piñon Wells, mts. n. of Mecca, *Jepson* 5988; Rock Creek, San Gabriel Mts., *Peirson* 80; Palmdale, w. Mohave Desert, *Davidson;* Mt. Pinos, Ventura Co., *Munz* 7001; Kelso, San Bernardino Co., *Jones;* New York Mts., *Jepson* 5439; Argus Mts., *Purpus* 5738; Cottonwood Creek, Inyo Co., *Jepson* 5088; Silver Cañon, White Mts., *Jepson* 7225; Benton, Mono Co., acc. *J. Grinnell.*

Refs.—PURSHIA GLANDULOSA Curran, Bull. Cal. Acad. 1:153 (1885), type loc. on Mohave side of Tehachapi Pass, *Curran;* Jepson, Man. 504 (1925). *Kunzia glandulosa* Greene, Pitt. 2:299 (1892). *Purshia tridentata* var. *glandulosa* Jones, Proc. Cal. Acad. ser. 2, 5:680 (1895).

24. **OSMARONIA** Greene

Shrub with simple entire deciduous leaves and caducous stipules. Flowers dioecious, white, fragrant, in nodding racemes terminating leafy branchlets. Staminate flower with spreading petals; stamens 15, in 3 rows, 10 inserted with the petals, 5 inserted lower down upon the disk lining the calyx-tube. Pistillate flower with erect petals; stamens present but abortive; pistils 5, distinct; styles short, lateral, jointed at base. Fruit consisting of 1 to 5 drupes. Drupes ovoid, 1-seeded, with a thin pulp and bony stone.—Species 1, western North America. (Greek, osme, fragrant, and Aronia, a Rosaceous genus proposed by Persoon.)

1. **O. cerasiformis** Greene. Oso Berry. Erect, 3 to 9 feet high; leaf-blades broadly oblong to obovate-oblong, obtuse to rounded at apex, or narrowed at each end, usually mucronate, glabrous or tomentulose below, 1½ to 4 inches long when mature; petioles 1 to 3 lines long; petals 2 to 3 lines long; drupes blue-black, 5 to 7 lines long.

North slopes of cañons: Santa Barbara coast; Coast Ranges, mainly toward the coast, from San Luis Obispo Co. to Del Norte Co., 100 to 1500 feet; Sierra Nevada from Tulare Co. to Shasta Co., 1500 to 4000 feet. North to British Columbia. Mar.-Apr.

Field note.—A number of species have been proposed by E. L. Greene as segregates of Osmaronia cerasiformis. These segregates rest upon slight variations and have no geographic significance. A sufficiently long series of specimens from any one locality shows many of these variations; contrariwise, specimens from type localities do not answer well to the corresponding diagnoses of the segregates or only indifferently. The pulp of the fruit is bitter but not poisonous. The bush is also called Bird Cherry and Indian Plum.

The seedlings are very remarkable on account of the shape of the cotyledons, the blades of which, 7 to 10 lines long and 9 to 11 lines wide, are round-reniform with markedly cordate base (cf. fig. 169). They are thus very different morphologically from those of any species of West American Prunus with which we are acquainted. The petioles are 5 to 7½ lines long, that is to say they are longer than the petioles of the foliage leaves of the seedling.

Locs.—Santa Barbara Co.: Gaviota Pass, acc. *Ralph Hoffmann.* Coast Ranges: Santa Margarita, *Berg;* Lucia, Santa Lucia Mts., *Jepson;* Pacific Grove, *Elmer* 5059; Lake San Andreas, San Mateo Co., *Jepson* 9542; Arroyo Mocho, Mt. Hamilton Range, *Jepson* 10,674; Point Lobos, San Francisco, *Jepson* 13,825; Lake Temescal, Oakland Hills, *Jepson* 13,826; Orinda, Contra Costa Co., *H. H. Haworth;* Tolenas Sprs., w. Solano Co., *R. H. Platt;* Olema, Marin Co., *Jepson;* St. Helena, *Jepson* 13,828; Middletown grade near Mt. St. Helena, *Jepson* 13,829; Duncans Mills, Sonoma Co., *Davy* 1645; Jackson Valley, w. Mendocino Co., *Jepson* 1865; Redwood Creek, n. Humboldt Co., *Jepson* 1974; Redding, *Blankinship;* Crescent City, *Shockley.* Sierra Nevada: Tule River Cañon, Tulare Co., *A. J. Perkins;* Old Colony Mill, Marble Fork Kaweah River, *Jepson;* Sequoia Mills, Fresno Co., *Eastwood;* Devils Gulch, Mariposa Co., *Congdon;* Amador Co. foothills, *Hansen* 211; Salt Creek, Shasta Co., *Hall & Babcock* 4012.

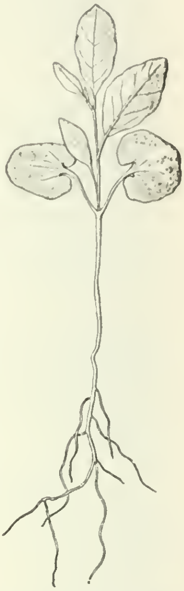

Fig. 169. Osmaronia cerasiformis Greene; seedling, × ½.

Refs.—Osmaronia cerasiformis Greene, Pitt. 2:191 (1891); Jepson, Fl. W. Mid. Cal. 285 (1901), ed. 2, 211 (1911), Man. 505, fig. 503 (1925). *Nuttallia cerasiformis* T. & G.; H. & A. Bot. Beech. 337, t. 82 (1838), type loc. "Columbia River," *Nuttall.* *Osmaronia obtusa* Greene, Pitt. 5:310 (1905), "foothills of the Sierra Nevada," *Hansen* 211. *O. demissa* Greene, l.c., "hills encircling San Francisco Bay," *Greene.* *O. bracteosa* Greene, l.c., type loc. Salt Creek, Kaweah, *Eastwood.* *O. laurina* Greene, l.c. 311, type loc. Santa Lucia Mts., *R. A. Plaskett.* *O. padiformis* Greene, l.c., type loc. Lake Co., *Heller* 5859.

25. **PRUNUS** L. Plum

Shrubs or small trees. Leaves simple, serrate. Flowers white, in clusters or sometimes solitary, from lateral buds borne on wood of the previous season, appearing before or with the leaves. Calyx-tube hemispheric or cup-shaped. Sepals 5, deciduous after flowering. Petals spreading. Stamens 15 to 30. Pistil 1; style terminal; ovules 2, pendulous. Drupe subglobose, usually 1-seeded; flesh sweet or bitter; stone globose or compressed, bony.—Species about 75, north temperate zone, also in tropical America and Asia. (The ancient Latin name of the Plum.)

Bibliog.—Greene, E. L., Some western red cherries (Proc. Biol. Soc. Wash. 18:56–60,—1905). Mason, S. C., The pubescent-fruited species of Prunus of the sw. states (Jour. Agr. Research 1:147–177, figs. 1–8, pls. 9–16,—1913); N. Am. species of Prunus (U. S. Dept. Agr. Bull. 179: 1–75, figs. 1–4, pls. 1–13,—1915). Meyer, K., Kulturgeschichte und systematische Beiträge zur Gattung Prunus (Fedde, Rep. Sp. Nov. 22: beih. 1–64, t. 1–3,—1923).

Ovary and drupe glabrous; flowers in clusters; corolla white; style deciduous.
Drupe subglobose or ovoid, 3 to 8 lines long; leaves folded together lengthwise in bud.
Leaves deciduous; drupe small, its flesh bitter or astringent.
Flowers in corymbs; drupe bright red (Subgenus CERASUS)............1. *P. emarginata.*
Flowers in racemes; drupe dark red (Subgenus PADUS)....................2. *P. virginiana.*
Leaves evergreen, usually spiny; drupe large, its flesh sweetish (Subgenus LAUROCERASUS)............3. *P. ilicifolia.*
Drupe oblong, purplish, ¾ to 1 inch long; leaves rolled up from one edge to the other in bud; flowers in umbels (Subgenus EUPRUNUS)............4. *P. subcordata.*
Ovary and drupe velvety-tomentose or pubescent; flowers mostly solitary, sometimes in 2s or 3s; style more or less persistent; all desert species.
Flowers pedicelled, 5 to 8 lines broad; leaves glabrous, convolute in bud (Subgenus ARMENIACA).
Leaves broad or roundish; corolla white............5. *P. fremontii.*
Leaves narrow; corolla light rose............6. *P. andersonii.*
Flowers sessile, 2 to 3 lines broad; corolla white; leaves puberulent, conduplicate in bud (Subgenus EMPLECTOCLADUS)............7. *P. fasciculata.*

1. **P. emarginata** Walp. BITTER CHERRY. Deciduous shrub 3 to 8 feet high, very rarely arboreous and 20 feet high; bark smooth, dull red; leaf-blades ovate or more commonly oblong-obovate, mostly obtuse, finely serrulate or crenulate, ¾ to 2 inches long, on petioles 1 to 3 lines long; blade usually with 1 or 2 glands just above junction with petiole; flowers 4 to 6 lines wide, 3 to 10 in short corymbs; drupes bright red, ovate to globose, 4 to 5 lines long, the pulp intensely bitter.

Rocky mountain ridges, rich moist slopes or hollows and along streams: Southern California mountains, 5000 to 9000 feet; Coast Ranges, 500 to 5000 feet; Sierra Nevada, 4000 to 8000 feet. North to Idaho and British Columbia. Apr.-May near the coast, June-July in the high mountains.

Note on the type.—In the type specimen of Prunus emarginata, the leaves are obtuse or sometimes obscurely retuse but not "emarginate"; they are essentially glabrous, as are also the pedicels and calyces; the petioles have 2 or 3 glands near the summit; *C. F. Baker* 691 (Crystal Springs Lake, San Mateo Co.) matches the type very closely. The type of Prunus (Cerasus) mollis (Dougl.) does not differ notably from the type of P. emarginata save that the peduncles, pedicels and calyces are markedly pubescent, the leaves beneath somewhat pubescent (Royal Botanic Gardens, Kew, in June, 1930).

Note on variation.—The two species named by Douglas, Prunus (Cerasus) emarginata and Prunus (Cerasus) mollis are both from the Columbia River region, the first a glabrous shrub, the second a pubescent small tree. The plants of the group cannot, however, be separated upon this basis. The tree form may be glabrous, and the low shrubs (Eureka, *Tracy* 4780) may be as pubescent as trees from the same general locality. The small trees of Strawberry Cañon, Berkeley (*Jepson* 9633), although practically glabrous, may reach a height of 26 feet.

Ten new segregates of this group named by E. L. Greene (Proc. Biol. Soc. Wash. 18:56–60) are based upon such characters as the height of the plants, amount of pubescence on various structures, shape and size of leaves and drupes, size and position of glands, and especially upon the shape and surface irregularities of the stones, all weak and variable characters in this group. The petiolar glands often vary as to one individual and the slight changes in pubescence are indefinable. The stones, likewise, vary so much in individual plants, with regard to marginal ridges and rugosities, that the character can have little significance as a criterion of segregation.

The rocky ridges and exposed mountain sides on the west slope of the Sierra Nevada bear for hundreds of miles, from one end of the range to the other, especially between 5000 and 8000 feet, extensive colonies or brush fields of this species. This form is shrubby, 4 to 8 feet high, tending to be glabrous, with small and commonly narrow leaf-blades (typically ¾ to 1½ inches long, 3 to 6 lines wide). In protected situations or in moist swales on the same slopes the individuals often become more or less arborescent, 10 to 30 feet high, with leaves typically 1½ to 2 inches long and 6 to 11 lines wide. This latter form may be more or less pubescent, and a given mountain side will show many intermediates to the glabrous states. Or again, broad-leaved shrubs may grow on the rocky talus (Bubbs Creek, South Fork Kings River, *Jepson* 798). In general it may be said, however, that the plants of the same colony vary within much smaller limits than does the species as a whole. The specimens cited below represent a series of continuous though slight variations.

Locs.—S. Cal.: South Fork Rock Creek, San Gabriel Mts., *Peirson* 492; Coldwater Cañon, San Gabriel Mts., *Peirson* 2152; Bear Valley, San Bernardino Mts. (Zoe 4:342); Raywood Flats, San Bernardino Mts., *Gilman;* betw. Tahquitz and Round Valley, Mt. San Jacinto, *Munz* 6032. Coast Ranges: Santa Lucia Mts., *Plaskett;* Los Gatos (foothills w.), *Heller* 7301; Crystal Sprs.

Lake, San Mateo Co., *C. F. Baker* 691; Strawberry Cañon, Berkeley, *Jepson* 9633, 9793; Asa Bean Ridge, ne. Mendocino Co., *Jepson* 13,834; Fortuna, Humboldt Co., *Tracy* 6638; Eureka, *Tracy* 4780; Bald Mt., n. Humboldt Co., *Tracy* 6195; Big Lagoon, Humboldt Co., *Tracy* 6685; Trinity Summit, n. Humboldt Co., *Jepson* 2034. Siskiyou Co.: Cuddihy Valley, *Jepson;* Salmon Mt., *Butler* 537; Shasta Sprs., *Jepson* 13,835; Niels Camp, Mt. Shasta, *Jepson* 13,836. Sierra Nevada: North Fork Middle Tule River, *Jepson* 4700; Lewis Camp, Kern River Cañon, *Jepson* 971; Atwell Mill, East Fork Kaweah River, *Jepson* 1161; Millwood, s. Fresno Co., *Jepson* 2773; Bubbs Creek, South Fork Kings River, *Jepson* 798; near Kaiser Mdw., n. side Kaiser Pass, *Jepson* 16,087; Crane Flat, Mariposa Co., *Jepson* 10,435; Glacier Pt., Yosemite, *Jepson;* Strawberry, Tuolumne Co., *Jepson* 13,837; Cedar Creek, Tuolumne Co., *A. L. Grant* 364; Sonora Pass road, Tuolumne Co., *A. L. Grant* 385; Squaw Peak, Placer Co., *C. J. Fox;* Emigrant Gap, Nevada Co., *Jepson* 14,075; Mineral, Tehama Co., *J. Grinnell;* upper Fall River valley, lava fields ne. of, *Jepson* 5763; Fandango Pass, Modoc Co., *Jepson* 7837; Mt. Bidwell, *Jepson* 7859.

Refs.—PRUNUS EMARGINATA Walp. Rep. 2:9 (1843); Jepson, Fl. W. Mid. Cal. ed. 2, 211 (1911), Man. 506, fig. 504 (1925). *Cerasus emarginata* Dougl.; Hook. Fl. Bor. Am. 1:169 (1834), type loc. "on upper part of the Columbia River, especially about Kettle Falls," *Douglas;* Jepson, Fl. W. Mid. Cal. 285 (1901). *C. glandulosa* Kell. Proc. Cal. Acad. 1:59 (1855), type loc. Placerville. *C. californica* Greene, Fl. Fr. 50 (1891), based on Coast Range shrubs (Humboldt Co., *Marshall*). *C. arida* Greene, Proc. Biol. Soc. Wash. 18:57 (1905), e. base of San Bernardino Mts., *Parish. C. prunifolia* Greene, l.c., mts. of Fresno Co., *Hall & Chandler* 385. *C. rhamnoides* Greene, l.c. 58, Mud Sprs., Amador Co., *Hansen* 1474. *C. kelloggiana* Greene, l.c., mts. e. of Chico, *R. M. Austin. C. obliqua* Greene, l.c. 59, Oroville, *H. E. Brown. C. parvifolia* Greene, l.c., s. side of Mt. Shasta, *H. E. Brown. C. mollis* Dougl.; Hook. Fl. Bor. Am. 1:169 (1834), "near the mouth of the Columbia," *Douglas. P. mollis* Walp. Rep. 2:9 (1843). *P. emarginata* var. *mollis* Brew.; B. & W. Bot. Cal. 1:167 (1876). *P. emarginata* var. *villosa* Sudw. U. S. Div. For. Bull. 14:240 (1897). *Cerasus erecta* Presl, Epim. Bot. 194 (1849), Nootka Sound, *Haenke. P. erectus* Walp. Ann. 3:854 (1852–53). *Cerasus pattoniana* Carr. Rev. Hort. 135 (1872). *P. emarginata erecta* Piper; Piper & Beattie, Fl. Nw. Coast 199 (1915).

2. **P. virginiana** L. var. **demissa** Torr. WESTERN CHOKE-CHERRY. (Fig. 170.) Erect slender deciduous shrub 2 to 10 feet high, or rarely a small tree up to 20 feet high; leaf-blades oblong-ovate or more commonly oblong-obovate, acute or abruptly short-pointed, finely serrate, 1 to 3½ inches long; petioles ½ inch long, with 1 or 2 glands just below their summits; racemes 2 to 4 inches long, terminating more or less leafy peduncles; flowers 3 to 6 lines wide; drupe red or dark purple, 3½ lines long, astringent.

Mountain slopes, cañons and creek bottoms, 800 to 7500 feet: mountains of Southern California; Coast Ranges; Sierra Nevada. North to Washington. Apr.-May.

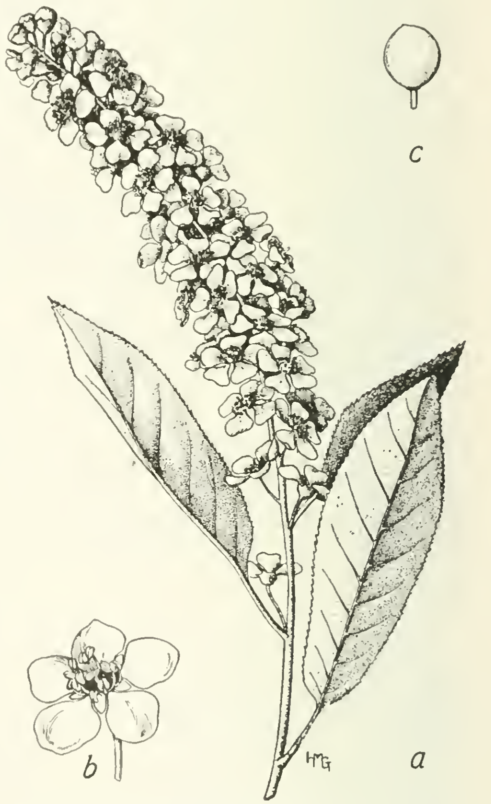

Fig. 170. PRUNUS VIRGINIANA L. var. DEMISSA Torr. *a*, flowering branchlet, × 1; *b*, fl., × 2; *c*, fr., × 1.

Note on variation.—Bushes from different stations vary slightly as to pubescence on the under side of the leaves. Specimens show numerous gradations from leaves essentially glabrous to leaves with a few obscure hairs to those states which are scantily though obviously pubescent. The pubescent form is possibly the more common, but throughout its range occur glabrous, subglabrous or very slightly pubescent forms all of which are in every other respect notably alike (Mt. Day, Santa Clara Co., *R. J. Smith*, and Calistoga, *Jepson* 13,841, glabrous forms, are quite like Berkeley Hills, *Stanley Flanders*, and Weldon Cañon, Vaca Mts., *Jepson* 2181, pubescent forms). Glandular petioles occur in all these states indifferently, or an occasional petiole may lack glands. Since there is no correlation with other structures, such very slight variations as to pubescence are not significant. In the Rocky Mts. the glabrous form is said to prevail and to have larger darker drupes than P. virginiana L. of the Atlantic region (cf. P. virginiana var. melanocarpa Sarg. Jour. Arn. Arb. 2:117,—1920; *Cerasus demissa* var. *melanocarpa* Nels. Bot. Gaz. 34:25,—1902, type from the Rocky Mts.; *Prunus melanocarpa* Rydb. Bull. Torr. Club 33:143, —1906; *Padus melanocarpa* Shafer, in Britt. & Shafer, N. A. Trees 504,—1908).

The spms. cited below as var. demissa we regard as representing one very definite form, although showing some slight variations in pubescence.

Locs.—S. Cal.: Mesa Grande, San Diego Co., *E. Ferguson* 59; French Valley, Palomar, *Jepson* 1495; San Bernardino Mts. (Pl. World 20:219); Icehouse Cañon, San Gabriel Mts., *Peirson* 82a; Rock Creek, San Gabriel Mts., *Peirson* 82. Coast Ranges: Santa Lucia Mts., *Jepson* 13,842; Little Arthur Creek, Gilroy, *Jepson* 9677; Mt. Hamilton, *Jepson;* Berkeley Hills, *Jepson* 2361; Calistoga (sw. of), *Jepson* 13,841; South Mill Creek, Ukiah, *Jepson* 9258; Jackson Valley, Mendocino Co., *Jepson* 1866; North Fork Middle Eel River, s. Trinity Co., *Jepson* 13,840; Sisson, Siskiyou Co., *Jepson* 13,839. Sierra Nevada: Cedar Creek, North Fork Kaweah River, *Jepson* 619; Yosemite, *Jepson* 13,838; Italian Bar, Tuolumne Co., *A. L. Grant* 14; Honey Lake Valley, Lassen Co., *Jepson* 7800; Deep Creek, Warner Mts., *L. S. Smith* 1113; Bidwell Creek, Modoc Co., *Jepson* 7908.

Economic note.—Cattlemen regard the Western Choke-cherry as somewhat poisonous to sheep and cattle. Browsing of the shrubs is, however, not likely to be fatal unless the herbage is eaten exclusively and in quantity in the midsummer season.

Refs.—PRUNUS VIRGINIANA L. Sp. Pl. 473 (1753), type from Virginia. Var. DEMISSA Torr. Bot. Wilkes Exp. 284 (1874). *Cerasus demissa* Nutt.; T. & G. Fl. 1:411 (1840), type loc. "plains of the Oregon toward the sea at the mouth of the Wahlamet," *Nuttall;* Jepson, Fl. W. Mid. Cal. 286 (1901). *Prunus demissa* Walp. Rep. 2:10 (1843); Jepson, Fl. W. Mid. Cal. ed. 2, 212 (1911), Man. 506, fig. 505 (1925). *Padus demissa* Roem. Syn. Rosifl. 3:87 (1847). *Padus virginiana* var. *demissa* C. K. Schn. Ill. Handb. Laubh. 1:642 (1906).

3. **P. ilicifolia** Walp. ISLAY. Evergreen shrub 4 to 7, or small tree up to 25 feet high; leaf-blades elliptic or ovate, acute or obtuse, coriaceous, spinose-toothed, 1 to 2 inches long, short-petioled; racemes 1 to 2½ inches long, on axillary leafless peduncles; flowers 2½ to 3½ lines wide; drupe red or dark purple, 6 to 8 lines thick, slightly obcompressed, apiculate; flesh thin, sweetish when ripe.

Rocky mountain slopes and rich valleys, 100 to 4000 feet: Napa Range to Santa Lucia Mts., Tehachapi Range and cismontane Southern California. South to Lower California. May, fr. Sept.

Field note.—In the chaparral formation Prunus ilicifolia is a low bush 3 to 5 feet high, assuming well the spiny look and rigid stems of its xerophytic associates. On rich valley floors or along streams it becomes a tree 20 to 30 feet high, with a crown nearly as broad and a trunk 8 to 16 inches in diameter. The trunk bark is dark brown or almost black, roughish with rather deep and close mostly longitudinal checks. This species has long been in cultivation. During the great frost, Dec. 8–11, 1932, some individuals in gardens were killed in the Sacramento Valley. It is also called Evergreen Cherry.

Locs.—Napa Range (e. of Napa), *F. A. Leach;* Cordelia, Solano Co., *Jepson* 3076; Oakland Hills; Pilarcitos stone dam, San Mateo Co., *Elmer* 4773; Los Altos, Santa Clara Valley, *Jepson* 9825; Alma, Santa Cruz Mts., *Jepson* 4171; Pacheco Pass, Santa Clara Co., *Jepson* 12,734; Carmel Valley, Monterey Co., *E. Ferguson* 258; Lopez Cañon, San Luis Obispo Co., *Unangst;* Cuddy Cañon, Mt. Pinos region, *Dudley & Lamb* 4620; Santa Barbara, *Jepson* 9162; Topango Cañon, Santa Monica Mts., *Epling & Ellison;* Arroyo Seco, San Gabriel Mts., *Peirson* 83; Cajon Pass, *Jepson* 6112; San Bernardino, *Parish;* Banning, *Toumey;* San Jacinto River Cañon, *Jepson* 1267; Hot Springs Mt., ne. San Diego Co., *Jepson.*

Var. **occidentalis** Bdg. ISLAND CHERRY. Shrub or often a tree 15 to 45 feet high; leaves oblong-ovate to suborbicular, 3 to 6 inches long, usually entire, but often spinosely serrate or denticulate as in the mainland form.—Santa Barbara Islands: Santa Rosa Isl., *T. Brandegee;* Pelican Bay, Santa Cruz Isl., *Jepson* 12,082; Swain Cañon, Santa Catalina Isl., *Jepson* 3059; San Clemente Isl., *T. Brandegee.* It also occurs in Lower California.

Field note.—This variety, var. occidentalis, often occurs in bushy form and yet becomes tall. On Santa Catalina Island one finds clumps 30 to 45 feet high, the 4 or 5 trunks ranging from 10 to 12 inches in diameter at 3 feet above the ground. The trunk bark is sometimes deciduous in squarish flakes, causing spots on the trunks which suggest axe "blazes." W. S. Lyon emphasized the orange-like aspect of the groves in some of the cañon-like valleys on Santa Catalina Island (Bot. Gaz. 11:202).

Refs.—PRUNUS ILICIFOLIA Walp. Rep. 2:10 (1843); Jepson, Fl. W. Mid. Cal. ed. 2, 212 (1911), Man. 506 (1925). *Cerasus ilicifolia* Nutt.; H. & A. Bot. Beech. 340, t. 83 (1840), type loc. Santa Barbara, *Nuttall;* Jepson, Fl. W. Mid. Cal. 286 (1901). *Laurocerasus ilicifolia* Roem. Syn. Rosifl. 3:92 (1847). Var. OCCIDENTALIS Bdg. Proc. Cal. Acad. ser. 2, 1:209 (1888). *P. occidentalis* Lyon, Bot. Gaz. 11:202 (1886), type loc. Santa Catalina Isl., *Lyon;* not P. occidentalis Swartz (1852–53). *Cerasus occidentalis* Greene, Bull. Cal. Acad. 2:396 (1887). *P. ilicifolia* var. *integrifolia* Sudw. Gard. & For. 4:51 (1891); Jepson, Man 507 (1925). *P. integrifolia* Sarg. Man. Trees N. Am. 531, fig. 441 (1905); not Walpers (1852–53). *Laurocerasus integrifolia* C. K. Schn. Ill. Handb. Laubh. 1:648 (1906). *Cerasus lyoni* Eastw. Occ. Papers Cal. Acad. Sci. 9:54 (1905). *Laurocerasus lyoni* Britt.; Britt. & Shafer, N. A. Trees 512 (1908). *P. lyoni* Sarg. Pl. Wilsonianae 74 (1911).

4. **P. subcordata** Benth. SIERRA PLUM. Deciduous shrub 4 to 8 feet high, or a tree up to 20 feet high, with crooked and rough gray-brown branches and more or less spinescent branchlets; leaf-blades ovate or elliptic to almost round, obtuse or truncate at base, rarely subcordate, serrulate, ¾ to 2 inches long, on petioles 2 to 4 lines long; flowers 6 lines wide, 2 to 4 in a cluster, on pedicels ½ inch long; drupe red, 9 to 11 lines long.

Cañon sides and mountain slopes: Sierra Nevada from Tulare Co. to Modoc Co., 2500 to 4500 feet; Coast Ranges from Monterey Co. to Siskiyou Co., 500 to 3500 feet. North to Oregon. Apr.

Field note.—In northeastern California the drupe matures into a fruit which is economically valued by the settlers. Indian women often gather these wild plums and bring them to the white people by way of barter. The fruits are first thrown into boiling water to do away with the bitterness residing in the skin, after which they are made into jellies or preserves. In the central coast region and the southern Sierra Nevada the carpels seldom set good fruit but develop into a bladdery structure which is caused by an Exoascus. The species is different from the ordinary Exoascus pruni Fckl. of cultivated plums but has apparently not been given a name (W. T. Horne, in Jepson Corr. 16:159 ms.). The shrub also propagates by buds developed on the roots (Howell Mt., *Jepson* 10,747).

Locs.—Coast Ranges: Pacific Grove (Woodcock in Jepson Corr. 7:340 ms.); Little Arthur Creek, Gilroy, *Jepson* 9710; Portola, San Mateo Co., *Elmer* 4533; Lake Chabot, San Leandro, *Jepson;* Marsh Creek, Mt. Diablo, *Jepson* 9991; Berkeley, *Jepson* 14,363; Manor, Marin Co., *Ynes Mexia* 2345; St. Helena, e. of, *Jepson* 14,362; Weldon Cañon, Vaca Mts., *Jepson* 13,833; Greasewood Hills, w. Tehama Co., *Jepson;* Yocumville, South Fork Salmon River, *Jepson;* Sisson, *Lemmon;* Scott Valley, Siskiyou Co., *Jepson;* Humbug, Siskiyou Co., *Butler* 644. Sierra Nevada: Milo, North Fork Tule River, *Jepson;* Grouse Valley, Tulare Co., *Jepson;* Clough Cave, South Fork Kaweah River, *Jepson* 4653; Hetch-Hetchy, *Jepson* 3438; Center Camp, Tuolumne Co., *A. L. Grant;* Keltz Mine, South Fork Stanislaus River, *A. L. Grant* 654; Nevada City, *Sonne;* Sierra City, *Jepson* 16,779; Belden, Plumas Co., *Jepson;* betw. Dana and Little Hot Springs Valley, ne. Shasta Co., *Jepson;* Cedarville Pass, Warner Mts., *Jepson;* Davis Creek, Modoc Co., *Jepson* 7829.

Var. **kelloggii** Lemmon. Drupe larger, yellow, more pulpy, sweeter.—Sierra Co. to Mt. Shasta.

Var. **rubicunda** Jepson. Two to 4 feet high; drupe subglobose, bright red, ¾ to 1⅛ inches long; pulp very bitter.—Modoc Co.

Var. **oregana** Wight. Leaf-blades ovate, abruptly acute, ¾ to 1¼ inches long; drupe dark red, more elliptic than in the species, finely pubescent, ¾ inch long.—Warner Mts., Modoc Co. North to southeastern Oregon.

Refs.—PRUNUS SUBCORDATA Benth. Pl. Hartw. 308 (1848), type loc. "in the Sacramento mountains," *Hartweg,* that is, Butte Co. foothills (Erythea 5:55); Jepson, Fl. W. Mid. Cal. 286 (1901), ed. 2, 212 (1911), Man. 507 (1925). Var. KELLOGGII Lemmon, Pitt. 2:67 (1890), type loc. Sierra City, Sierra Co., *Lemmon;* Jepson, Man. 507 (1925). Var. RUBICUNDA Jepson, Man. 507 (1925), type loc. Willow Creek Cañon, Modoc Co., *B. C. Goldsmith.* Var. OREGANA Wight, U. S. Dept. Agr. Bull. 179:33 (1915); Jepson, Man. 507 (1925). *P. oregana* Greene, Pitt. 3:21 (1896), type loc. Yainax Indian Reservation, se. Ore., *R. M. Austin.*

5. **P. fremontii** Wats. DESERT APRICOT. Deciduous shrub or small tree, 5 to 15 feet high with spiny branchlets; leaf-blades ovate or roundish, serrulate, usually faintly purplish-veined, ½ to 1½ inches long, on short slender petioles; flowers

solitary or somewhat fascicled, 5 to 6 lines broad, pediceled; ovary densely pubescent; fruit oblong-ovoid or elliptic-ovoid, sparingly or minutely puberulent, 4 to 6 lines long.

Washes, valley flats and cañon sides, 1500 to 3000 feet: ranges on west side of the Colorado Desert. South to Lower California. Feb.-Mar.

Note on the species name.—The original description of Prunus fremontii Wats. (Bot. Cal. 2:442) defines the Desert Apricot and cannot be applied to any other species of Prunus in California. Moreover, the specimen first cited (Oriflamme Cañon, San Diego Co., *Cleveland*) is the Desert Apricot, as well as the second cited specimen (*Parry & Lemmon*). That Fremont's own specimen is of another species is immaterial. The diagnosis of a species is decisive; the specific name cannot run against it nor can a specimen. In framing international rules of nomenclature botanists well understood that diagnoses, when published, have the character of permanence. The identity of the species rests on the diagnosis. Diagnoses as published cannot be altered. Modification, addition, subtraction can only be by subsequent publication, which nevertheless forms no part of the original diagnosis. No international rules take account of specimens. Specimens have not the same elements of identity or permanence as printed diagnoses. Specimens may be lost, destroyed, and more especially mislabeled or mixed. But over and above this it is clear, in this particular instance, that the original diagnosis of Prunus fremontii Wats. and the two first-cited specimens apply clearly to the Desert Apricot. The attempt of S. C. Mason, therefore, to apply a new name (P. eriogyna) to this species, because Fremont's specimen is of another species, runs counter to the international rules of nomenclature and to all botanical tradition. That Fremont did not collect Prunus fremontii is also immaterial. There are numberless cases in which the specific part of the binomial has proven contradictory or unfitting, but such reasons are not regarded as valid for changing the specific name.

Locs.—Palm Cañon, Riverside Co., *Jepson* 1377; Box Cañon, Mason Valley, San Diego Co., *Jepson* 8660, 8659; Cuyamaca Mts., San Diego Co., *Newlon;* Mountain Springs grade, San Diego Co., *Jepson* 11,807.

Var. **pilulata** Jepson. Leaf-blades orbicular, more or less truncatish or subcordate at base, 5 to 8 lines long; fruit (immature) subglobose, a little flattened, a little broader than long, 4 lines long.—Foothills, west side of the Colorado Desert in San Diego Co.: Sentenac Valley; Mountain Sprs. sta., acc. *Peirson.*

Refs.—PRUNUS FREMONTII Wats. Bot. Cal. 2:442 (1880), type loc. Oriflamme Cañon, San Diego Co., *Cleveland;* Jepson, Man. 507 (1925). *Amygdalus fremontii* Abrams, Bull. N. Y. Bot. Gard. 6:385 (1910). *P. eriogyna* Mason, Jour. Agr. Research 1:168, fig. 5 (1913). Var. PILULATA Jepson, Man. 507 (1925), type loc. Wagon Wash near Sentenac Cañon, San Diego Co., *Jepson* 8769.

6. **P. andersonii** Gray. DESERT PEACH. Spreading divaricately branched deciduous shrub 2 to 6 feet high with very thorny branchlets; leaves fascicled, the blades glabrous, oblong or oblanceolate, minutely serrulate, 4 to 10 lines long, narrowed to a short petiolar base, mostly with several brownish veins; flowers solitary, 5 to 8 lines broad, on pedicels 1½ to 4 lines long; fruits flattened-globose and a little oblique, 6 to 7 lines long, covered with a close dark brown pubescence or indument.

Arid slopes and desert mesas, 3500 to 7500 feet: east side of the Sierra Nevada from Modoc Co. to Inyo Co. Western Nevada. May.

Locs.—Modoc. Co., *L. S. Smith;* Long Valley, Lassen Co., *Jepson* 7788; Leevining Cañon, Mono Co., *Ottley* 1081; White Mts., *Purpus* 5805; Nelson Range, Inyo Co., *Hall & Chandler* 7118. Nevada: Miller Mt., Mineral Co., *Shockley* 216.

Refs.—PRUNUS ANDERSONII Gray, Proc. Am. Acad. 7:337 (1868), type loc. foothills, Carson, Nevada, *C. L. Anderson;* Jepson, Man. 507 (1925). *Amygdalus andersonii* Greene, Fl. Fr. 49 (1891). *Emplectocladus andersonii* Nels. & Ken. Muhl. 3:139 (1908).

7. **P. fasciculata** Gray. DESERT ALMOND. Divaricately branched deciduous shrub with gray bark and very thorny branchlets, 2 to 8 feet high; leaves fascicled, minutely pubescent, the blades narrowly oblanceolate, entire or with 1 or 2 minute teeth on each side, 3 to 8 (or 10) lines long, mostly with one brownish vein; flowers more or less dioecious, solitary or fascicled on the short spurs, sessile or nearly so, 2 to 3 lines broad; fruit ovoid, acutish, light brown with a dense velvet coat of short bristly hairs, 4 to 5 lines long; flesh thin.

Desert slopes and mesas, 3000 to 6500 feet: Mohave and Colorado deserts and bordering ranges; north to Inyo Co. East to Utah and Arizona. Apr.-May.

Field note.—In 1928 well-developed shrubs were observed in the Pinto Basin on the north borders of the Colorado Desert. One individual 10 feet high formed a rounded clump 22 feet broad, its divaricate branches and branchlets making a remarkably close weave on the periphery of the crown.

Locs.—Lone Pine, Inyo Co., *Jepson* 5136; Hanaupah Cañon, Panamint Range, *Jepson* 7059; Telescope Peak, Panamint Range, *Jepson* 7006; New York Mts., *Jepson* 5442; Ord Mt., Mohave Desert, *Jepson* 5865, 5924; Cameron sta., Tehachapi Mts., *Jepson* 15,876; Swartout Valley, San Gabriel Mts., *Peirson*; Cajon Pass, *Peirson* 1987; Cottonwood Spr., Cottonwood Mts., *Jepson* 12,579; Palm Cañon of San Jacinto, Riverside Co., *Jepson* 1344.

Var. **punctata** Jepson var. n. Young shoots very pubescent; leaves glabrous, glandular-punctate.—(Pulli pubescentissimi: folia glabra, glanduloso-punctata.)—Sandy flats, 200 to 600 feet: northern Santa Barbara Co. (Bicknell sta., *Jepson* 12,669, type) to San Luis Obispo Co., *Ida Blochman*.

Refs.—PRUNUS FASCICULATA Gray, Proc. Am. Acad. 10:70 (1875); Jepson, Man. 507 (1925). *Emplectocladus fasciculatus* Torr. Pl. Frem. 10, pl. 5 (1853), type loc. "Sierra Nevada of California, probably in the southern part of the range," *Fremont*. *Amygdalus fasciculata* Greene, Fl. Fr. 49 (1891). *Lycium spencerae* Mcbr. Contrib. Gray Herb. 53:18 (1918), type loc. Cajon Pass, *Mary F. Spencer* 366. Var. PUNCTATA Jepson.

PRUNUS COMMUNIS Arcangeli, Fl. Ital. 209 (1882). *Amygdalus communis* L. Sp. Pl. 473 (1753), type loc. Mauretania. Almond. Tree 15 to 25 feet high; leaf-blades lanceolate, closely serrate; flowers solitary, sessile; fruit with a dry flesh which separates from the thin stone.—Native of Asia, much cultivated in California in the lowland valleys, the fruits disseminated by blue-jays and flickers and the tree, thus, sometimes spontaneous: Vaca Valley; Berkeley. Feb.

26. **SORBUS** L.

Deciduous trees or shrubs. Leaves pinnate with many leaflets. Flowers white, in compound cymes. Stamens about 20. Ovary inferior, 2 to 5-celled; styles as many as the cells, distinct. Fruit a small berry-like pome.—Species about 9, north temperate zone. (The ancient Latin name.)

1. **S. sitchensis** Roem. WESTERN MOUNTAIN ASH. Many-stemmed erect nearly glabrous shrub 3 to 9 feet high; leaves 4 to 6 inches long; leaflets 5 to 7 pairs, oblong, serrate except at base, 1 to 2 inches long; corymbs 2 to 3 inches broad; petals 2 lines long; styles villous at base; fruit coral-red, 4 lines long.

Along streams on steep slopes in the mountains, 7000 to 9000 feet: Sierra Nevada from Tulare Co. to Modoc Co. North Coast Ranges from Humboldt Co. to Siskiyou Co. North to Alaska, east to Labrador. July.

Locs.—North Coast Ranges: Lasseck Peak, Humboldt Co., *Goddard* 694; Trinity Summit, n. Humboldt Co., *Tracy* 5292; Salmon Summit, w. Siskiyou Co., *Jepson* 2075a; Etna Creek (head of), Siskiyou Co., *Butler* 282. Sierra Nevada: Cliff Creek, Tulare Co., *Culbertson* 4674; Onion Valley, Inyo Co., *Jepson* 895; Rancheria Creek, Huntington Lake, Fresno Co., *A. L. Grant* 1456; Mt. Lyell, *Jepson* 3344; Benson Lake, Tuolumne Co., *Jepson* 4512; Kennedy Lake, Tuolumne Co., *A. L. Grant* 515; Suzy Lake, Eldorado Co., *Jepson* 8182. Medicine Lake, e. Siskiyou Co., *M. S. Baker* 471.

Var. **densa** Jepson. Leaflets more crowded, 1¼ to 2 inches long; corymbs denser, the pedicels and calyx-tube hairy.—Montane, 3500 to 8700 feet: Mariposa Co. to Siskiyou Co.

Locs.—Sierra Nevada: Stubblefield Cañon, Tuolumne Co., *Jepson* 4530; Lovers Leap, Eldorado Co., *F. M. Anderson*; Bear Valley, Nevada Co., *Jepson* 13,849; North Fork Bidwell Creek, Warner Mts., Modoc Co., *Jepson* 7900. Siskiyou Co.: Sisson, *Jepson* 13,850; Woolly Creek, *Butler* 281.

Refs.—SORBUS SITCHENSIS Roem. Syn. Monog. Rosifl. 3:139 (1847), type from Sitka, *Mertens*; Jepson, Man. 508, fig. 506 (1925). *Pyrus occidentalis* Wats. Proc. Am. Acad. 23:263 (1888), "mountains from Washington to California", *E. Hall*. *S. occidentalis* Greene, Fl. Fr. 54 (1891). *S. californica* Greene, Pitt. 4:131 (1900), "middle elevations in the Sierras." *Pyrus sitchensis* var. *californicus* Smiley, Univ. Cal. Publ. Bot. 9:233 (1921). *S. americana* var. *sitchensis* Sudw. U. S. Dept. Agr. Misc. Circ. 92:133 (1927). Var. DENSA Jepson, Man. 508 (1925), type loc. Stubblefield Cañon, Yosemite Park, *Jepson* 4530. *Pirus sambucifolia* B. & W. Bot. Cal. 1:189 (1876), not C. & S. (1827).

27. **PHOTINIA** Lindl.

Evergreen shrub with simple coriaceous serrate leaves. Flowers white, small, numerous, in little cymes aggregated in a terminal corymbose panicle. Calyx turbinate, 5-cleft. Petals spreading. Stamens (in ours) 10, in pairs opposite the calyx-teeth; filaments subulate. Pistils 2 or 3, lightly united, only lightly adherent to the fleshy calyx-tube, the thickened calyx-teeth closed over them in fruit. Fruit bright red, ovoid, berry-like. Seeds 1 or 2 in each cell.—Species about 17, western North America, central America and southeastern Asia. (Greek photeinos, shining, alluding to the foliage.)

1. **P. arbutifolia** Lindl. CHRISTMAS BERRY. TOYON. Shrub, rarely a small tree, 5 to 15 or even 26 feet high; leaf-blades oblong, acute at base and apex, dark green, lighter beneath, 2 to 4 inches long, on petioles ½ to ¾ inch long; panicle in anthesis rather dense, 2 to 3 inches high; corolla 2½ lines broad; fruit 3 to 4 lines long.

Rocky mountain slopes and deep soil of cañon bottoms, 10 to 3500 feet: Sierra Nevada foothills from Tehama Co. to Tulare Co.; Coast Ranges from Humboldt and Shasta Cos. to San Luis Obispo Co., thence south to San Diego Co. South to Lower California. July, fr. Nov.-Jan.

Field note.—Photinia arbutifolia is, in many mountain ranges, an important member of the chaparral formation. Temperature is doubtless one of the factors which determine the limits of its distribution. On the margins of its range in Humboldt County shrubs were severely injured during the great frost of December 8–11, 1932, when a minimum of 21.8 degrees F. was recorded at Eureka (J. P. Tracy). It crown-sprouts, usually vigorously, after a fire, or when cut off at the ground. Individuals often consist, therefore, of several stems arising from a thickened base; after repeated fires this base continues to enlarge and becomes a woody platform ½ to 2 feet across and 3 to 8 inches in thickness. As a berry food Photinia arbutifolia is one of the most important for California birds and the most important of winter foods. It is a markedly handsome shrub when covered from November to January with its fine clusters of crimson berries which are produced only on second-year wood. These berry clusters are much used for holiday decoration in the Christmas season. In the years 1911 and 1912 and thereabouts most of the stock for the San Francisco market came from the region of Tuolumne County. With proper care of the shrubs, the quality of the berries as a rule improves as a result of the harvest pruning, but the Tuolumne region was so ill treated by the Italian gatherers that the district ceased for some years to be a source of supply. In the southern Sierra Nevada this species occurs very slightly. In Fresno and Tulare counties there is but one known station in each county. One of the earliest of California shrubs to be discovered, Photinia arbutifolia was first collected at Monterey by Thaddeus Haenke in 1791.

Locs.—Sierra Nevada foothills: Tehama Co., *Jepson;* Butte Co. foothills, *R. M. Austin;* Colfax, Placer Co., *Jones;* Gwin Mine, Calaveras Co., *Jepson;* Parrott's Ferry, Stanislaus River, *Jepson;* Greeley Hill, Mariposa Co., *Jepson;* Humphreys, near Black Mt., e. Fresno Co., *H. P. Kelley;* East Fork Limekiln Creek, Tulare Co., *E. B. Homer.* Marysville Buttes, *Jepson* 13,823. Coast Ranges: Shasta, Shasta Co., *Blankinship;* Hupa, *Goddard;* near South Yollo Bolly Mt., *Taylor;* Bridgeville, Humboldt Co., *Tracy* 7338; Fort Seward, Humboldt Co., *Landergen;* Red Mountain Creek, nw. Mendocino Co., *Jepson* 9420; Ukiah, *Jepson;* Hough's Sprs., ne. Lake Co., *Jepson;* St. Helena, *Jepson* 13,824; Weldon Cañon, Vaca Mts., *Jepson;* Twin Sisters Peak, w. Solano Co., *Jepson;* Inverness, Marin Co., *Jepson;* Fairfax, Marin Co., *Jepson* 9492; Berkeley Hills, *Jepson;* Las Trampas Ridge, Contra Costa Co., *Jepson;* Mt. Diablo, *Jepson* 9516; Black Mt., Santa Clara Co., *Elmer* 4688; Cedar Mt., Hamilton Range, *Forbes;* Pajaro Hills, n. Monterey Co., *Chandler* 458; Arroyo Seco, Santa Lucia Mts., *Jepson;* Cantua Creek, w. Fresno Co., *S. C. Lillis.* S. Cal.: Sycamore Cañon, Santa Inez Mts., *Jepson;* Pelican Bay, Santa Cruz Isl., *Jepson* 12,107; Elysian Park, Los Angeles, *Braunton* 569; Santa Anita Cañon, San Gabriel Mts., *Peirson* 77; San Bernardino foothills, *Parish;* Santa Catalina Isl., *Blanche Trask* (arboreous, 10 to 30 feet high, and 6 to 18 inches in trunk diameter); Palomar Mt., *Jepson;* Coldwater Cañon, Santa Ana Mts., *E. A. Zumbro* 433; Hot Springs Mt., ne. San Diego Co., *Jepson;* Banner Cañon, e. San Diego Co., *Chandler* 5459; San Diego, *Palmer* 86. A large-fruited form occurs on Santa Catalina Island and on San Clemente Island.

Var. **cerina** Jepson. Berries yellow.—Monterey Co.; San Luis Obispo Co.; Santa Catalina Isl.; San Bernardino Co.

Locs.—Corral de Tierra, Monterey Co., *H. A. Greene;* Templeton, San Luis Obispo Co.; Avalon, Santa Catalina Isl., *Trask;* Reché Cañon, San Bernardino Valley, *Parish* 8045.

Refs.—PHOTINIA ARBUTIFOLIA Lindl. Bot. Reg. pl. 491 (1820); Jepson, Man. 508, fig. 507 (1925). *Crataegus arbutifolia* Ait. Hort. Kew. ed. 2, 3:202 (1811), type cultivated, seeds from

Cal., *Menzies*. *Heteromeles arbutifolia* Roem. Syn. Rosifl. 3:105 (1847); Jepson, Fl. W. Mid. Cal. 287 (1901), ed. 2, 212 (1911). *P. foliolosa* Nutt.; Roem. l.c. *P. nudiflora* Nutt.; Roem. l.c. *P. salicifolia* Presl, Epim. Bot. 204 (1849), "California ad Monte-Rey et ad portum San Blas Mexici occidentalis", *Haenke*. *Heteromeles salicifolia* Abrams, Bull. N. Y. Bot. Gard. 6:381 (1910). *H. fremontiana* Dec. Nov. Ann. Mus. Par. ser. 1, 10:144 (1874), type from Cal., *Fremont*. Var. CERINA Jepson, Man. 508 (1925), type loc. Templeton, San Luis Obispo Co., *Pearl C. Jared*.

28. **PYRUS** L. Pear. Apple

Deciduous trees or shrubs with simple leaves and stipules which disappear early. Flowers in corymbs. Calyx-tube urnshaped. Petals white or pink, with claws. Stamens about 20. Ovary inferior, 2 to 5-celled, ovules 2 in each cell, the carpels chartaceous; styles as many as the cells, united at base. Fruit a pome.—Species about 50, North America, Europe and Asia. (Ancient Latin name of the pear.)

1. **P. diversifolia** Bong. Oregon Crab Apple. Small tree or many-stemmed shrub 10 to 50 feet high; leaf-blades ovate, pointed, serrate, or some 3-lobed or with a coarse tooth on each side, green above, pale, pubescent and eventually rusty beneath, 1 to 3¾ inches long; corymbs 4 to 10-flowered; petals white, elliptical, 3 to 5 lines long; carpels commonly 3; fruits oblong or oblong-ovoid, 6 to 7 lines long, yellowish (or pinkish on one side), aging purple-black.

Cañons and valley flats, 50 to 1000 feet: Napa and Sonoma Cos. to Del Norte Co. North to Washington. Apr.-May (fl.), Aug.-Sept. (fr.).

Locs.—Napa Soda Sprs. (Fl. W. Mid. Cal. 287); Agua Caliente, Sonoma Co. (*M. S. Baker* in Jepson Corr. 31:540 ms.); Sebastopol, *M. S. Baker;* Santa Rosa Creek, Sonoma Co. (Pac. R. Rep. 4:85); White Thorn Valley, s. Humboldt Co., *Tracy* 6304; betw. Fortuna and Loleta, Humboldt Co., *Jepson* 1917a; Arcata, *Chesnut & Drew;* Orick, Humboldt Co., *M. S. Baker* 196; Lake Earl, Del Norte Co., *Davy.*

Refs.—PYRUS DIVERSIFOLIA Bong. Veg. Sitcha 133 (1832), type loc. Sitka, Alas., *R. H. Mertens*. *P. rivularis* Dougl.; Hook. Fl. Bor. Am. 1:203, t. 68 (1834), type loc. Nootka Sound, *Menzies;* Jepson, Fl. W. Mid. Cal. ed. 2, 213 (1911), Man. 508 (1925). *Malus rivularis* Roem. Syn. Rosifl. 3:215 (1847); Jepson, Fl. W. Mid. Cal. 287 (1901).

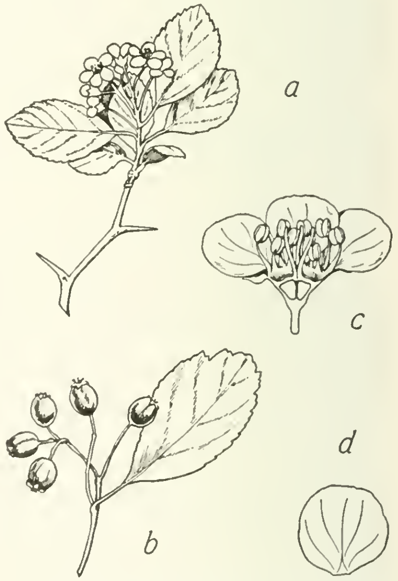

Fig. 171. Crataegus douglasii Lindl. *a*, fl. branchlet, × ½; *b*, fr. branchlet, × ½; *c*, long. sect. of fl., × 2½; *d*, petal, × 3.

29. **CRATAEGUS** L. Thorn

Thorny shrubs or trees. Leaves simple, toothed or lobed, deciduous. Flowers in ours white, heavy-scented, in short corymbs. Calyx-tube urnshaped. Petals roundish. Stamens 10 to 20. Ovary inferior, or its summit free, 2 to 5-celled, or the 2 to 5 carpels merely contiguous and not united; styles distinct. Fruit more or less drupe-like, red or purple, containing 2 to 5 bony 1-seeded nutlets, these united or separable; calyx-lobes reduced to small teeth, persistent.—Species about 55 (although multiplied by some to 1000 or more), north temperate zone. (Greek kratos, strength, in reference to the wood.)

1. **C. douglasii** Lindl. Western Black Haw. (Fig. 171.) Much branched shrub 5 to 9 feet high or sometimes a scraggly tree up to 20 or 30 feet high; thorns stout, ½ to 1 inch long; twigs reddish; leaf-blades obovate or ovate, doubly serrate above

the cuneate entire base and often lobed or rarely with 1 or 2 deep slashes, 1 to 2 (or 4) inches long, on short petioles; flowers 5 to 6 lines broad; fruit black, 5 to 6 lines long.

Cañon flats, 2500 to 4000 feet: Sonoma Co. to Humboldt Co., thence east to Modoc Co. North to British Columbia, east to Michigan. May-June.

Locs.—North Coast Ranges: Watson School, Bodega, Sonoma Co., *Jepson* 15,934; Green Valley, Sonoma Co., *M. S. Baker;* Sebastopol, Sonoma Co., *Davy;* Round Valley, ne. Mendocino Co., *Westerman;* South Yager Creek (head of), Humboldt Co., *Tracy* 5977; Shasta Sprs., Siskiyou Co., *Jepson* 13,496; Sisson, *Jepson* 13,853; Lowden, below Hamburg, Klamath River, *Jepson* 2951. Shasta and Modoc Cos.: Fall River Sprs., ne. Shasta Co.; Egg Lake, w. Modoc Co., *M. S. Baker;* Fandango trail, Warner Mts., *L. S. Smith* 156, 905; Ft. Bidwell, *Manning* 149.

Refs.—Crataegus douglasii Lindl. Bot. Reg. t. 1810 (1836), type from "northwest America," *Douglas*, the species based, in part at least, on a cultivated plant; Jepson, Man. 509 (1925). *C. punctata* var. *brevispina* Dougl.; Hook. Fl. Bor. Am. 1:201 (1834), type loc. "northwest coast of America," *Douglas*. *C. rivularis* Nutt.; T. & G. Fl. 1:464 (1840), type from Ore., *Nuttall;* Jepson, Fl. W. Mid. Cal. 287 (1901), ed. 2, 213 (1911). *C. consanguinea* var. *douglasii* T. & G. l.c. *Anthomeles douglasii* Roem. Syn. Rosifl. 3:140 (1847). *Mespilus rivularis* C. Koch, Wochenschr. 5:372 (1862). *M. douglasii* Aschers. & Graebn. Syn. Mitteleur. Fl. 6^2:24 (1906). *C. gaylussacia* Hel. Bull. S. Cal. Acad. 2:69 (1903), type loc. Lagoon, Sebastopol, Sonoma Co., *Heller* 6052.

30. **PERAPHYLLUM** Nutt.

Low shrub. Leaves simple, mostly fascicled at the ends of the branchlets or short spurs. Flowers appearing with the leaves, solitary or in a sessile 2 to 3-flowered umbel. Ovary inferior, 2-celled, each cell becoming incompletely divided by a false partition; styles 2. Fruit globose, fleshy.—Species 1. (Greek pera, excessively, and phullon, a leaf.)

1. **P. ramosissimum** Nutt. Squaw-apple. Intricately branched, 2 to 4 feet high, with short rigid branchlets and grayish bark; leaves oblanceolate, entire or very minutely serrate, ½ to 1¼ (or 2¼) inches long; petals roundish-obovate, spreading, pale rose, 4 lines long; fruit yellowish, 4 to 5 lines in diameter.

High interior plateau, 4000 to 5000 feet: Lassen Co. to northeastern Shasta Co. and Modoc Co. North to Oregon, east to the Rocky Mts. Apr.-May.

Locs.—Buffalo Ravine, West Valley, Susanville, *Sonne;* Fall River valley, ne. Shasta Co., *M. S. Baker* 389; Likely, Modoc Co., *Manning;* Alturas (plateau w.), *L. S. Smith* 1199.

Refs.—Peraphyllum ramosissimum Nutt.; T. & G. Fl. 1:474 (1840), type loc. "near the Blue Mts. of the Oregon," *Nuttall;* Jepson, Man. 509 (1925).

31. **AMELANCHIER** Medic. June Berry

Shrubs or small trees with simple deciduous leaves. Flowers white, in racemes. Calyx-tube campanulate, more or less adnate to the ovary; calyx-lobes 5, narrow, persistent. Petals ascending. Stamens indefinite, about 20, the outer row with longer filaments. Ovary partly or wholly inferior, 5-celled, each cell in fruit divided into 2 by a partition from the back; styles 5, united below. Fruit berry-like, globose, the cells 1-seeded.—Species about 10, north temperate zone. (Savoy name of the Medlar.)

Bibliog.—Wiegand, K. M., The genus Amelanchier in eastern N. Am. (Rhod. 14:117–161, pls. 95–96,—1912). Standley, P. C., A new Amelanchier from se. Cal. (Proc. Biol. Soc. Wash. 27:197–198,—1914).

1. **A. alnifolia** Nutt. Western Service Berry. Shrub 3 to 12 or even 24 feet high; leaf-blades mostly elliptic or suborbicular, sharply serrate above the middle, or less commonly entire, ¾ to 1¾ inches long; petioles 4 to 6 lines long; racemes short and rather dense; petals narrowly oblong, or somewhat cuneate at base, 4 to 6 lines long; calyx tomentulose, white-hairy or glabrous; fruit purplish, 2½ to 3 lines in diameter.

Rocky mountain slopes, cañon sides or along streams: mountains of southern California and the Sierra Nevada, 2500 to 8500 feet; Coast Ranges, 100 to 6000 feet. North to Alaska, east to the Rocky Mts. May-June, fr. July-Sept.

Note on variation.—Amelanchier alnifolia is continuously though not highly variable as to pubescence and leaf shape. Pubescence of the leaves or lack of it, and pubescence of the sepals are not definitely associated with any other character. The leaf-blades are broad, elliptic or suborbicular and serrate at apex or a little below the apex on the sides. Plants otherwise alike may have puberulent (Tahoe, *Jepson* 7726) or glabrous (Merced Big Trees, *Jepson* 100c) leaves. The following stations indicate representation of the species in California, with only such variation as may be considered immaterial on edaphic grounds. Sierra Nevada: Parker Creek, Warner Mts., *Taylor & Bryant;* Forestdale, sw. Modoc Co., *Nutting;* Mineral, Tehama Co., *J. Grinnell;* Bear Valley, Nevada Co., *Jepson* 178a; Summit sta., Nevada Co., *Jepson* 13,870; Mt. Tallac, *Jepson* 8129; Kings Cañon, *Jepson* 774a. Tehachapi Mts., *Davidson.* Southern California: Palomar Mt., *Jepson* 1539. Coast Ranges: Sisson, Siskiyou Co., *Jepson* 59a; betw. Mud Spr. and Trinity Summit, n. Humboldt Co., *Jepson* 2031; Cahto, Mendocino Co., *Jepson* 1868; Ft. Bragg, *W. C. Mathews* 153.

In the Coast Ranges and southward to Southern California, the leaf-blades tend to have few small teeth at apex or are even sometimes entire (var. SUBINTEGRA Jepson comb. n.), though rarely, the teeth may be large or the serrations extend half way to the base.—Glenbrook, w. Lake Co., *Jepson* 126c; Howell Mt., Napa Co., *Jepson* 32a; Berkeley, *Jepson* 5f; Moraga Ridge, Oakland Hills, *Jepson* 3499; Slate's Creek, San Mateo Co., *Elmer* 4659; Priest Valley, se. Monterey Co., *Jepson* 2671; upper Nacimiento River, w. Monterey Co., *Jepson* 1695; lower Rock Creek, San Gabriel Mts., *Peirson.* This subintegra form also occurs in the low Sierra Nevada foothills: betw. Sheep Ranch and Mountain Ranch, Calaveras Co., *Davy* 1596. The foregoing specimens of the subintegra form in the totality of characters represent one common but very narrow phase, in spite of the fact that the calyx-lobes may be glabrous externally (*Jepson* 2671), obviously hairy (*Jepson* 32a) or with intermediate states. Such a series, especially as to the calyx, shows the unimportance of pubescence as a basis for segregation.

In the Sierra Nevada and North Coast Ranges occurs a form (var. SISKIYOUENSIS Jepson comb. n.) with oblong or elliptic leaf-blades serrate usually to the middle or nearly to the obtuse base; they are thin at flowering time, weakly puberulent or rarely thinly arachnoid below.—Sierra Nevada: Mineral, Tehama Co., *J. Grinnell;* Saints Rest, betw. Sonora and Strawberry, *A. L. Grant* 791; Benson Lake, Tuolumne Co., *Jepson* 4508; Snow Creek, Yosemite, *Jepson* 10,490; Sequoia Lake near Millwood, Fresno Co., *H. P. Kelley.* North Coast Ranges: Quartz Valley, Siskiyou Co., *Butler* 1238; Mt. St. Helena, *Jepson* 10,383; Howell Mt., Napa Co., *Jepson* 32b.

On the desert slopes of the Sierra Nevada and the high mountains of Southern California or in ranges bordering the deserts a shrub is found (var. PALLIDA Jepson) with elliptic leaves pale or glaucous or whitish-pubescent beneath: Hemet Valley, San Jacinto Mts., *Peirson* 3057; Cushenbury Sprs., n. side San Bernardino Mts., *Parish;* Icehouse Cañon, San Antonio Mts., *Peirson* 2155; Fandango Pass, Modoc Co., *Jepson* 7838. In the Panamint Range occurs the var. COVILLEI Jepson with obtuse leaves abruptly acute at the very apex and petals 2½ to 3 lines long. Shrubs of the arid or desert slopes whose leaves are prominently veiny on the upper side represent var. VENULOSA Jepson: Julian, e. San Diego Co., *T. Brandegee;* Phelan, n. slope San Antonio Mts., *Walker Jones;* Providence Mts., *T. Brandegee;* Argus Peak, Inyo Co., *Purpus* 5376; Convict Creek, Mono Co., *Almeda Nordyke.* This last cited phase, var. venulosa, is extremely shadowy. All the phases, as above indicated, are freely supplemented by intergrades representing many indefinite fractional variations.

Refs.—AMELANCHIER ALNIFOLIA Nutt. Jour. Acad. Phila. 7:22 (1834); Jepson, Fl. W. Mid. Cal. 288 (1901), ed. 2, 213 (1911), Man. 509, fig. 508 (1925). *Aronia alnifolia* Nutt. Gen. 1:306 (1818), type loc. "Fort Mandan [N. Dak.] to the northern Andes" [Rocky Mts.], *Wyeth. Amelanchier florida* Lindl. Bot. Reg. t. 1589 (1833), type from "northwestern America", *Douglas. A. glabra* Greene, Fl. Fr. 52 (1891), type loc. Donner Lake, *Bonte. A. gracilis* Hel. Muhl. 2:59 (1905), type loc. Shasta Sprs., Siskiyou Co., *Heller* 7970. *A. alnifolia* var. *typica* C. K. Schn. Ill. Handb. Laubh. 1:739 (1906). Var. SUBINTEGRA Jepson. *A. subintegra* Greene, Pitt. 5:109 (1903), type loc. Mt. St. Helena, *Greene. A. recurvata* Abrams, Bull. Torr. Club 37:151 (1910), type loc. Topa-topa Mts., Ventura Co., *Abrams & McGregor* 107. Var. SISKIYOUENSIS Jepson. *A. siskiyouensis* C. K. Schn. Ill. Handb. Laubh. 1:735 (1906), type from "mountains of California". Var. PALLIDA Jepson, Man. 509 (1925). *A. pallida* Greene, Fl. Fr. 53 (1891), "northern and northeastern" California. Var. COVILLEI Jepson, Man. 510 (1925). *A. covillei* Standl. Proc. Biol. Soc. Wash. 27:198 (1914), type loc. Cottonwood Cañon, Panamint Range, *Coville & Funston* 962. Var. VENULOSA Jepson, Man. 510 (1925). *A. venulosa* Greene, Pitt. 4:21 (1899), type loc. Cushenbury Sprs., *Parish.*

LEGUMINOSAE. PEA FAMILY

Herbs, shrubs, or trees. Leaves alternate, stipulate, usually compound. Leaflets 1 to many, usually entire. Calyx synsepalous, 5-toothed or -cleft (or in Lupinus 2-lipped), mostly persistent. Corolla with 5 petals, regular or somewhat irregular or in ours commonly papilionaceous, that is, highly irregular and butterfly-like: the upper petal is called the banner; the lateral petals are called the wings;

the two lower petals are joined by their edges to form the keel; the banner in the bud enfolds the wings which in turn cover the keel-petals; all the claws are free from one another. Petals essentially hypogynous, rarely perigynous in ours. Stamens 10, united into a sheath around the ovary (monadelphous), or the upper stamen distinct from the others (diadelphous), or sometimes all distinct. Pistil 1, superior, 1-celled. Fruit a legume (2-valved pod), with 1 row of seeds on the ventral side, commonly opening by both the dorsal and ventral sutures, the valves twisting in opposite directions, or sometimes indehiscent. Seeds mostly kidney-shaped, without endosperm.—Amorpha has but one petal. Acacia has numerous stamens. Cytisus and Ulex (ours) have no stipules; their calyces are 2-lipped. The seeds of Cassia have endosperm. The pod in Astragalus is sometimes 2-celled. Calliandra has numerous stamens and a sympetalous corolla.—Genera about 490 and species about 11,000, all regions of the earth, especially in the tropics and on plains and steppes of temperate lands.

Bibliog.—Alefeld, Ueber Vicieen (Bonplandia 9:139–153,—1861). Gray, A., Characters of some new plants of California and Nevada [new species of Leguminosae] (Proc. Am. Acad. 6:522–527,—1865). Baillon, H., Leguminosae in Nat. Hist. Plants 2:20–382, figs. 15–208 (1872). Taubert, P., Leguminosae (Engler & Prantl, Nat. Pflzfam. 3^3:70–396, figs. 38–136,—1888). Holzinger, J. M., Range of Amorpha fruticosa (Erythea 1:131–132,—1893). Eastwood, A., Rediscovery of Thermopsis macrophylla (Zoe 5:76–78,—1900). Macbride, J. F., Notes on certain Leguminosae of the tribe Psoraleae (Contrib. Gray Herb. 65:14–23,—1922). Johnston, I. M., Parkinsonia and Cercidium (Contrib. Gray Herb. 70:61–68,—1924). Rydberg, P. A., Fabaceae: Psoraleae (N. Am. Fl. 24:1–64,—1919; 24:65–136,—1920). Britton, N. L., and Rose, J. N., Caesalpiniaceae (N. Am. Fl. 23:201–340,—1930).

Economic Refs.—Holzinger, S. J., Mesquite (Forestry and Irrigation 8:447–453, 5 ill.,—1902). Hitchcock, A. S., Alfalfa growing (U. S. Dept. Agr. Farmers Bull. 215, pp. 1–39, figs. 1–7,—1905). Coe, H. S., Sweet Clover: growing the crop (U. S. Dept. Agr. Farmers Bull. 797:1–34, figs. 1–11,—1917); utilization (l.c. 820:1–32, figs. 1–13,—1917). Piper, C. V., & McKee, R., Bur Clover (U. S. Dept. Agr. Farmers Bull. 693:1–14, figs. 1–7,—1923). Beath, O. A., Poisonous Plants [Oxytropis, Astragalus, Lupinus] (Proc. Soc. Agr. Sci. 39:39–47,—1919). Pieters, A. J., Sweet Clover (U. S. Dept. Agr., Lflt. 23:1–8, figs. 1–3,—1928). Cottle, Kathleen B., Value of Melilotus indica to agriculture (Mo. Bull. Cal. Dept. Agr. 18:489–490,—1929). Brock, A. A., Alhagi camelorum (Mo. Bull. Cal. Dept. Agr. 18:641–642,—1929). Braun, E. W., Alfalfa (Univ. Cal. Agr. Exp. Sta. Bull. 521:1–37, figs. 1–11,—1931). Ball, W. S., and Robbins, W. W., Camel Thorn (Mo. Bull. Cal. Dept. Agr. 22:258–259, ill.,—1933). Bottel, A. E., Introduction and control of Camel Thorn (Mo. Bull. Cal. Dept. Agr. 22:261–263, figs. 1–3,—1933).

A. Corolla regular or only slightly irregular, not at all papilionaceous (obscurely so in no. 3); stamens distinct (except in no. 1); trees or shrubs (herbs or shrubs in no. 8).

Stamens numerous, much exserted; corolla sympetalous; flowers in heads or spikes; leaves bipinnate.
  Stamens monadelphous; unarmed bush.......................................1. CALLIANDRA.
  Stamens distinct; spiny shrub.......................................2. ACACIA.
Stamens 10; corolla choripetalous (except 1 species of no. 4).
  Leaves simple; flowers red-purple; cismontane shrub.......................................3. CERCIS.
  Leaves compound; deserts.
    Flowers sessile in dense cylindric spikes; corolla minute (1 to 1½ lines long); leaves usually twice pinnate; desert trees.......................................4. PROSOPIS.
    Flowers in racemes.
      Fertile stamens 7, the sterile 3; anthers fixed by the base; leaves simply pinnate; low bushes.......................................5. CASSIA.
      Stamens 10, all fertile; anthers fixed by the middle; leaves bipinnate.
        Trees; calyx-lobes soon reflexed, deciduous.
          Pods flattish; leafy branches with axillary thorns....................6. CERCIDIUM.
          Pods torulose; branches without axillary thorns (in ours)....................7. PARKINSONIA.
        Shrubs or low herbs; calyx-lobes not reflexed, persistent......8. HOFFMANSEGGIA.

B. Corolla papilionaceous.

1. STAMENS DISTINCT; LEAVES PALMATELY 3-FOLIOLATE.

Flowers yellow, in racemes; stipules conspicuous; herbs.......................................9. THERMOPSIS.
Flowers purple, solitary; stipules none; very spiny shrub.......................................10. PICKERINGIA.

2. STAMENS DIADELPHOUS OR MONADELPHOUS.

a. Calyx deeply 2-lipped; stamens 5 long and 5 short, their filaments monadelphous but free at apex; anthers alternately larger and smaller.

Sides of the roundish banner turned or rolled sharply backwards; flowers mostly blue or purple, rarely white, yellow or red, in terminal racemes, mostly in whorls; leaves palmate, of 4 to many leaflets; seeds without strophiole.......11. LUPINUS.
Sides of banner not rolled or bent backward; flowers yellow; seeds with strophiole; introduced shrubs.
  Leaves 3-foliolate, or the branches leafless; calyx herbaceous, divided half-way into 2 lips.......12. CYTISUS.
  Leaves simple, or the branches leafless; calyx membranous, divided nearly to base into 2 lips. 13. ULEX.

b. Calyx not deeply 2-lipped.

Leaves compound.
  Leaves 3-foliolate, the leaflets commonly denticulate or serrulate; (see also no. 20).
    Flowers in a raceme or spike; corolla deciduous after flowering; leaves pinnately 3-foliolate.
      Pod curved or spirally coiled; style subulate.......14. MEDICAGO.
      Pod small, ovoid; style filiform.......15. MELILOTUS.
    Flowers in a head, rarely in a capitate umbel or short spike; corolla withering-persistent after flowering; leaves palmately (rarely pinnately) 3, sometimes 4 or 5-foliolate; pod straight.......16. TRIFOLIUM.
  Leaves pinnate, the leaflets commonly entire; (leaves simple in some Paroselas, no. 19).
    Leaves commonly odd-pinnate (two species palmate in Psoralea), the leaflets entire.
      Flowers in umbels, sometimes solitary; leaflets commonly 3 to many, sometimes 1 or 2.......17. LOTUS.
      Flowers in racemes or spikes; leaflets many (few in no. 20 and often few in no. 19).
        Herbage glutinous or glandular-dotted.
          Pod not prickly; flowers purple or whitish or rose-color.
            Corolla of 1 petal; shrub.......18. AMORPHA.
            Corolla of 5 petals.
              Shrubs, sometimes herbs; deserts.......19. PAROSELA.
              Herbs; Sierra Nevada and Coast Ranges.......20. PSORALEA.
          Pod prickly, indehiscent; flowers yellowish.......21. GLYCYRRHIZA.
        Herbage not glandular-punctate nor glutinous (viscid in 1 species of no. 24); herbs.
          Leaves and upper stipules spinose-tipped.......22. KENTROPHYTA.
          Herbage unarmed.
            Tip of keel obtuse or merely acute.......23. ASTRAGALUS.
            Tip of keel prolonged into a distinct beak.......24. OXYTROPIS.
    Leaves equally pinnate.
      Tree, spinescent; two upper calyx-teeth united.......25. OLNEYA.
      Herbs.
        Rachis not produced into a tendril; pods somewhat stipitate, septate between the seeds.......26. SESBANIA.
        Rachis produced into a branched tendril, rarely terminating in a bristle or imperfect leaflet; pods not septate between the seeds; flowers commonly in spikes or racemes.
          Style hairy all around at summit.......27. VICIA.
          Style hairy on the upper side.......28. LATHYRUS.
Leaves simple; very spiny low shrub.......29. ALHAGI.

1. **CALLIANDRA** Benth.

Herbs or low shrubs with slender branches. Leaves equally bipinnate, with small leaflets. Flowers conspicuous on account of the numerous long-exserted colored stamens, borne in globose heads, the heads terminal on axillary peduncles. Corolla sympetalous, tubular, equally 5-cleft. Stamens monadelphous, inserted on the edge of a disk lining the calyx. Pod linear, with a cord-like border.—Species over 100, tropical and subtropical Americas, a few in India. (Greek kallos, beautiful, and andra, stamen.)

1. **C. eriophylla** Benth. Mock Mesquite. (Fig. 172.) Bush ½ to 2 feet high; leaves with (1 or) 2 to 4 pairs of pinnae; pinnae with 9 to 12 pairs of leaflets; leaflets oblong, 1 to 1½ lines long; stipules linear-lanceolate, somewhat indurated, subpersistent; calyx reddish-brown, turbinate, 5-toothed, the teeth triangular; corolla dark red, cleft ⅗ the way down into oblong-ovate acute lobes; stamens crimson, 9 to 11 lines long, about 3 times as long as the corolla; pods 2 inches long.

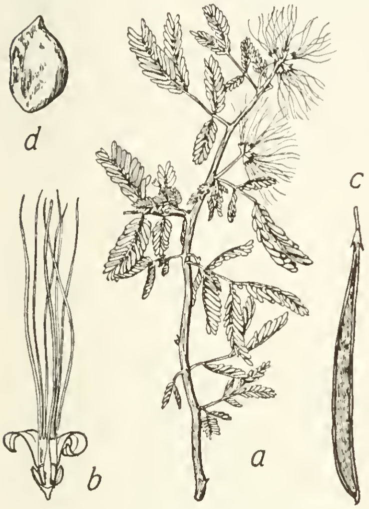

Fig. 172. Calliandra eriophylla Benth. *a*, flowering branch, × ½; *b*, long. sect. of fl., × 2; *c*, pod, × ½; *d*, seed, × 2.

Sandy washes and cañons, 400 to 800 feet: eastern Colorado Desert in the Chocolate Mts. East to western Texas, south to Mexico and Lower California. Mar.-May.

Locs.—Calipatria (hills ne. of), *Edith Rockwell;* Mesquite Cañon (Muhl. 7:77; Madroño 1:270); Ogilby (6 mi. n.), *Peirson* 9788.

Refs.—Calliandra eriophylla Benth. Lond. Jour. Bot. 3:105 (1844), type loc. Chila in district of Pueblo, Mexico, *Andrieux* 405. *Anneslia eriophylla* Britt. Trans. N. Y. Acad. Sci. 14:32 (1894). *Feuilleea eriophylla* Ktze. Rev. Gen. Pl. 1:187 (1891). *C. chamaedrys* Engelm.; Gray, Mem. Am. Acad. n. s. 4:39 (1849), type loc. Chihuahua, Mex., *Wislizenius, Gregg.*

2. **ACACIA** Willd.

Trees or shrubs with bipinnate leaves and small leaflets. Flowers minute, in ours yellow, perfect or polygamous, condensed in pedunculate cylindrical or globular spikes. Spikes solitary or fascicled in the axils or disposed in a diffuse terminal panicle. Calyx 4 or 5-toothed. Petals more or less united below. Stamens numerous, distinct or nearly so, much exserted. Pod 2-valved or indehiscent.—Species about 500, all continents but chiefly Australia. (Greek akakie, from ake, a point, referring to the prickles.)

1. **A. greggii** Gray. Catclaw. Straggling shrub 4 to 7 feet high, or sometimes becoming a small tree up to 15 feet high; branches armed with scattered short but stout curved prickles, rarely unarmed; leaves deciduous, 1 to 2 inches long, with 1 or mostly 2 or 3 pairs of pinnae, each pinna with 4 to 6 pairs of pale leaflets; leaflets oblong or elliptic to oblong-obovate, 1 to 3½ lines long; flowers in cylindrical spikes ¾ to 2¼ inches long; pods 2 to 11-seeded, much compressed, more or less constricted between the seeds and curved or contorted, narrowed to a cuneate base, 2 to 6 inches long, or sometimes much reduced, 1-seeded and simulating a fry-pan in outline.

Washes, valleys or hillsides, 200 to 2500 feet: Colorado Desert; north to the Ord and Providence mountains in the Mohave Desert. East to Texas, south to Mexico. Apr.-Oct.

Habit note.—The trunk, encased in light brown bark roughly fissured into somewhat interlaced ribbon-like strands ¾ to 1 inch wide, tends usually to part at or near the ground and produce long horizontally spreading or even trailing branches, with erect shoots. While we were in the Riverside Mts. along the Colorado River in 1912 an average individual 11 feet high with crown diameter of 31 feet was measured, its branches having diameters of 4, 5, 6⅔ and 7⅓ inches respectively. In the Palo Verde Valley a tree 19 feet high and 35 feet in crown diameter, had four main limbs with diameters of 11, 11, 10⅔, 8⅔ inches respectively. Another individual, 12 feet high and 30 feet in crown diameter, had a trunk 4 feet high and 17 inches in diameter at one foot above the ground. In the beds of the washes on Ord Mt. occur individuals 6 to 16 feet high with trunks 4 to 13 inches in diameter at one foot above the ground. Everywhere the individuals, on account of their reclining trunks, tend to cover more ground than any other desert tree except the Honey Mesquite (Prosopis juliflora var. glandulosa Ckll.). Usually, throughout the desert, the individuals are comparatively few, scattered over the mesas or along the beds of washes, though sometimes this species is gregarious. Traveling northerly through San Felipe Valley in 1920 we noted that the shrubs increase in frequency until, on the north side, near Sentenac Cañon, there is established a pure association one-half mile wide and two miles long.

Locs.—Intramontane region: Warner Hot Sprs. (Zoe 4:342); San Gorgonio Pass, *Jepson.* Colorado Desert: Vallecito, e. San Diego Co., *Jepson;* San Felipe Valley, *Jepson;* Grapevine Spr., e. of Warner Pass, *Jepson;* Yaqui Well, e. San Diego Co., *J. T. Howell* 3250; Collins Valley, *Jepson;* San Gorgonio Pass, *Jepson;* Palm Cañon of San Jacinto, *Jepson* 1379; Morongo Pass, *J. T. Howell* 2884; Thousand Palms Cañon, Conchilla Range, *Jepson;* County Well, near Lookout Mt., n. of Indio, *Jepson* 6021; Cottonwood Spr., n. of Mecca, *Jepson;* Palo Verde Valley, *Jepson;* Black Point, Riverside Mts., Colorado River, *Jepson* 5246a. Mohave Desert: Brannans Ldg., Whipple Mts., *Jepson;* Little Chemehuevis Valley, *Jepson* 5213; Coyote Holes, w. of Twentynine Palms, *Jepson;* Shays Well, *Jepson;* Ord Mt., *Jepson* 5892a; Daggett, *Mary Beal;* Providence Mts., *T. Brandegee.* Ariz.: Ehrenberg, *Jepson* 5256; mouth of Williams Fork, Colorado River, *Jepson.*

Refs.—ACACIA GREGGII Gray, Pl. Wright. 1:65 (1852), type loc. w. Tex., *Wright;* Jepson, Man. 514, fig. 515 (1925). *Senegalia greggii* Britt. & Rose, N. Am. Fl. 23:110 (1928).

3. **CERCIS** L. JUDAS TREE

Shrubs. Flowers red-purple, in umbel-like fascicles, appearing from winter buds in advance of the simple leaves. Stipules caducous. Calyx in anthesis broader than long, with 5 broad obtuse teeth. Corolla obscurely papilionaceous; banner smaller than the wings and enclosed by them in the bud; keel-petals larger than the wing-petals and not united. Stamens 10, distinct, declined, the filaments clavate-dilated towards the base. Pod oblong, very flat, the upper suture with a winged margin. Embryo straight.—Species 5, North America, Europe, Asia. (Kerkis, Greek name of the oriental Judas Tree.)

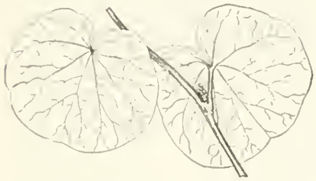

Fig. 173. CERCIS OCCIDENTALIS Torr.; leaves, × ⅓.

1. **C. occidentalis** Torr. (Fig. 173.) WESTERN RED-BUD. Stems usually clustered, 8 to 15 feet high; leaf-blades orbicular, cordate at base with nearly closed sinus, 2½ to 3½ inches broad; pods 2 to 2½ inches long and 8 lines wide.

Foothills, 225 to 4000 feet: inner North Coast Ranges from Solano Co. to eastern Mendocino Co. and Shasta Co., thence south through the Sierra foothills to Kern Co.; Cuyamaca Mts. of Southern California. East to Texas. Feb.-Apr.

Geographic range and habit.—There are in California remarkable gaps in the distribution of Western Red-bud. It does not occur in the South Coast Ranges, in Napa Valley or thence eastward in the broken country beyond Pope Valley. So conspicuous a species could scarcely escape observation; and it seems, further, well established that it does not grow in the mountains of Santa Barbara Co., nor anywhere southward in the mountains of coastal Southern California except in the Cuyamaca Mountains. Avoiding the Redwood belt, it occurs near Ukiah, where it most nearly approaches the habitats of Sequoia sempervirens. Its northern limit, as now known, is on the Klamath River, since it has not yet been reported from southern Oregon where it might be expected to occur. In the foothills on the east side of the inner North Coast Range it is fairly frequent and is also well-known throughout the length of the Sierra Nevada foothills.

A bush is usually composed of a number of erect clustered stems forming a clump. Pods are produced abundantly, but often contain few good seed. Seed germinate tardily and seem to have some of the ecological traits of the seed of typical chaparral shrubs (cf. fig. 174). The slender branches of the root system are sometimes very long, as much as 20 feet, 1 to 2 inches in diameter at butt and tapering gradually down to pencil size. On account of their toughness the native tribes used these roots in basketry. In the old days of mule teaming straight slim Red-bud sticks were used on freight wagons to bind down loads of hay in order to prevent the shifting of binding-chains on the mountain grades.

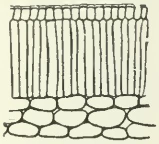

Fig. 174. CERCIS OCCIDENTALIS Torr.; cross sect. of seed coat, with the closely packed outer palisade layer, × 135.

Locs.—Cottage Grove, Klamath River, *Jepson;* Forks of Salmon, *Jepson;* Cecilville, sw. Siskiyou Co., *Jepson;* Kennet, Shasta Co., *Jepson;* Coram, Shasta Co., *Blankinship;* Redding, *Blankinship;* Noble ranch to Dyer ranch, New River, *Jepson;* Hupa Valley, *Jepson;* Grouse

Creek, e. Humboldt Co., *Chesnut & Drew;* Salt Creek, w. Tehama Co., *Jepson;* Grindstone Creek near jct. Stony Creek, w. Glenn Co., *Jepson* 16,309; Asa Bean trail at crossing of Middle Eel River, s. Trinity Co., *Jepson;* Round Valley, ne. Mendocino Co. (Contrib. U. S. Nat. Herb. 7:356); Hough Sprs., n. Lake Co., *Jepson* 9006; Cold Creek, Potter Valley, acc. *Anson Blake;* South Mill Creek, Ukiah, *Jepson* 4005, 4009; Sonoma Geysers, Miyakma Range, *Bolander* 3946; Middletown, Lake Co., acc. *Anson Blake;* Capay Valley, Yolo Co.; Putah Cañon, *Jepson* 10,410; Pleasant Valley, nw. Solano Co., *Jepson* 13,576; Miller Cañon, Vaca Mts., *Jepson* 13,581; Gates Cañon, Vaca Mts., *Jepson* 13,579. Marysville Buttes: South Peak summit, *Jepson* 13,580. Sierra Nevada: McCloud River, 6 mi. below Bartles, *M. S. Baker;* lava beds, upper Fall River Valley, *Jepson;* Big Chico Creek, Butte Co., *Heller* 11,194; Randolph Flat, Nevada Co., *Jepson* 13,578; Auburn, *M. E. P. Ames;* Ione, *Braunton* 1072; Jacksonville, Tuolumne Co., *A. L. Grant* 639; Mormon Bar, Mariposa Co., *Congdon;* San Joaquin River, Fresno Co. shore opp. Fish Creek, *Jepson* 12,879; Badger, Tulare Co., *Woodbridge Metcalf* (fls. white); Watson Spr., North Fork Kaweah River, *Jepson* 584; Grouse Valley, South Fork Kaweah River, *Jepson;* Milo, North Fork Tule River, *Jepson;* Tehachapi Mts. acc. *H. L. Bauer.* S. Cal.: betw. Julian and Banner, *Ray Bailey;* betw. Cuyamaca and Oriflamme mines, *Abrams* 3924.

Refs.—CERCIS OCCIDENTALIS Torr.; Gray, Jour. Bost. Soc. Nat. Hist. 6:177 (1850), type loc. "rocky plains of the upper Guadaloupe" (w. Tex.), *Lindheimer;* Jepson, Fl. W. Mid. Cal. 289 (1901), ed. 2, 215 (1911), Man. 511, fig. 509 (1925). *C. nephrophylla* Greene; Fedde, Rep. Sp. Nov. 11:111 (1912), type loc. San Diego Co., *Palmer, Vasey. C. latissima* Greene, l.c., "mountains of California", *Geo. B. Grant. Siliquastrum occidentale* Greene, Man. Reg. S. F. Bay 84 (1894).

4. PROSOPIS L.

Deciduous shrubs or trees, the branches armed with spines or thorns. Leaves deciduous, bipinnate with 1 pair (rarely 2 pairs) of pinnae; leaflets in equal pairs, numerous, small, entire. Flowers small, greenish-yellow, regular, sessile, in axillary pedunculate cylindrical spikes. Calyx campanulate, with 5 short teeth, deciduous. Petals 5, very much exceeding the calyx. Stamens 10, distinct, exserted. Ovary stipitate, villous. Pod straight, curved or coiled, indehiscent, the many seeds separated by thick spongy partitions.—Species about 25, tropical and subtropical, all continents except Europe and Australia. (Greek prosopis, ancient name for the Butter-bur.)

Pinnae with 10 to 15 pairs of leaflets; thorns axillary, in pairs, singly or none; pod straight or curving, compressed..........1. *P. juliflora.*
Pinnae with 5 to 8 pairs of leaflets; spines in pairs, stipular; pod spirally coiled into a straight cylindric body..........2. *P. pubescens.*

1. **P. juliflora** DC. var. **glandulosa** Ckll. HONEY MESQUITE. Several-stemmed or a short-trunked tree with crooked or arching branches forming a rounded or depressed crown, 10 to 20 feet high; leaflets linear, ½ to 1 inch long; stipules linear and membranous; thorns 1 or 2, axillary, ¼ to 1½ inches long, or sometimes absent; flowers 2 lines long, condensed in slender cylindrical spikes mostly 2 to 3½ inches long; petals oblong, clawed, distinct; stamens twice as long as the petals; pods borne in drooping clusters, 1 to 6 to each spike, linear, at first flat, later becoming thickened, curved, 4 to 8 inches long, 4 to 5 lines broad, irregularly constricted between the seeds which are about 3 lines long.

Sandy or alkaline valleys and washes, 200 to 2100 feet: Death Valley region; central and eastern Mohave Desert; Colorado Desert; local in the upper San Joaquin Valley, western Mohave Desert and in coastal Southern California. East to Texas, south to northern Mexico. May-Oct.

General habit.—The trunk nearly always branches at or very near the ground and produces low rounded wide-spreading crowns. The individuals, though lacking height may, nevertheless, attain large size. At the Eagle Springs in Death Valley one tree, measured in 1917, was 20 feet high and 66 feet broad. Near Thousand Palms Cañon, in the Conchilla Range, a tree discovered by us in 1914 had a height of 37 feet, a crown diameter of 114 feet and three sprawling trunks arising from the base, the first 2 feet 5 inches in diameter at 2 feet, the second 1 foot 7 inches in diameter at 3 feet, the third 1 foot 3 inches in diameter at 1½ feet. Thus these trees, though lacking stature, have a certain impressiveness on account of their very broad base. In the Palo Verde Valley, where the tree is extremely common on the flats, the trunks are short (¼ to 4 feet), or as often branching widely at the very ground. In this valley in 1912 we measured a tree 18 feet high whose trunk diameter at 18 inches above the ground was 2 feet and ¼ inch. Fence posts are made from the timber and if charred on the outside are said not to be attacked by boring beetles. Because the tree is long-lived and has a dense fine-grained wood it is chosen as a "bearing" tree by land surveyors. For fuel in the desert it forms a constant resource for the settlers. It is especially prized for branding-iron fires, because it holds heat so well. Subaxillary to the stout thorns on the branchlets are developed abbreviated branchlets or spurs roughly similar to those of Prunus armeniaca (Apricot) or Ginkgo biloba.

Field note.—In a good season the abundance of straw-yellow flowers transforms the appearance of the tree. The honey gathered by the honey bee is fine, clear and delicious, hence "Honey Mesquite." The flowering season is usually long and a tree may set fruit two or three times in the course of the long summer. Each raceme with its numerous flowers matures only about 1 to 4 fruits, though sometimes as many as 18, the pods having a tendency to set on one side of the axis. The most interesting and useful tree of the desert, its sweet nutritious pods are greedily eaten by animals and even in their natural state serve man if he be not too delicate. When ground, however, the fruit is highly valued. E. L. Greene, during his journey in 1880 across the Colorado Desert writes: "the mesquite meal which Indians and Mexicans manufacture by drying and grinding these pods and their contents, is perhaps the most nutritious bread-stuff in use amongst any people" (Am. Nat. 15:30). In the overflowed lowlands in the Palo Verde Valley along the Colorado River considerable quantities of the beans are still harvested each year by the Indians who sell the pods to the settlers for winter cattle feed. They are also an important source of food for skunks, bobcats and coyotes, especially in the Colorado River bottoms. Individual trees are often infested by the Desert Mistletoe (Phoradendron californicum Nutt.) and not infrequently die as a result of the attack of the parasite.

The tree is an almost infallible sign of water, either on the surface or at varying distances below. Furnace Creek wash, after leaving its cañon in the Funeral Mts., has built up a great detrital fan on the floor of Death Valley, forming a half-moon about five miles across. The base of the fan is rubble, but outside this is a zone of finer sandy sediment. On this sediment zone occurs the Honey Mesquite, forming thus a great semicircle extending from the base of the foothills south of the entrance to Furnace Cañon out over the floor of the valley in a curving band one-half mile wide, returning again to the base of the foothills north of the cañon (Jepson Field Book, 33:121,—1917, ms.). Clumps of the bushes mark also the water-bearing stratum in the foothills of the Funeral Mts., near the Furnace Creek ranch in Death Valley.

The sprawling habit of the tree acts as a break to wind-blown sand and a dune often forms about an individual. Rounded sand dunes, 10 to 20 feet high and two to three times as broad, with the branches of a tree protruding from the periphery, form a feature of the flats in the Coachella Valley and in Death Valley. As the branches continue to lengthen the dune increases in size, so that a tree, in the course of time, is very deeply buried with only the tips of the crown protruding.

Locs.—Upper San Joaquin Valley: Buena Vista Lake, *F. M. Anderson*. Eastern Inyo Co.: Panamint Valley; Emigrant Sprs., *Jepson;* Furnace Creek Ranch, Death Valley, *Jepson;* Eagle Sprs., Death Valley, *Jepson* 6943a; Tecopa, *Jepson*. Mohave Desert: Lancaster (15 mi. e.), *Peirson;* Barstow, *Jepson* 4790; Box S Spr., *J. T. Howell* 2688; Warrens Well, e. of Morongo Valley, *J. T. Howell;* Cronese Valley, *Jepson;* Needles, *Jepson* 5483; Little Chemehuevis Valley, Colorado River, *Jepson* 5211. Colorado Desert: Riverside Mts., *Jepson;* Cottonwood Spr., Cottonwood Mts., *Jepson;* Twenty-nine Palms, *Jepson;* Indio, *Jepson;* Palm Cañon of San Jacinto, *Jepson* 1378; Borrego Valley, *Jepson* 8816; Collins Valley, *Jepson;* Sentenac Valley, below San Felipe Valley, *Jepson;* Harper Well, *Jepson;* Vallecito, e. San Diego Co., *Jepson;* Holtville, plain e., *Jepson;* Alamo River, e. of Calexico, *Parish* 8297. Coastal S. Cal.: San Bernardino, *Parish;* San Jacinto Lake; Aguanga, *Jepson;* Temecula, *Parish;* San Diego (Zoe 4:342).

Refs.—Prosopis juliflora DC. Prod. 2:447 (1825), type from s. Jamaica. Var. glandulosa Ckll. Bull. Agri. Exp. Sta. N. Mex. 15:58 (1895); Jepson, Man. 513, fig. 513 (1925). *P. glandulosa* Torr. Ann. Lyc. N. York 2:192, pl. 2 (1828), type loc. "on the Canadian?", *James*.

2. **P. pubescens** Benth. Screw-bean Mesquite. Shrub or small tree 10 to 35 feet high, with narrow crown and ascending branches; branches armed with stout often whitish stipular spines 2 to 6 lines long; leaves canescently puberulent; leaflets oblong, 1 to 5 lines long; flowers 2 lines long, borne in spikes 2 to 3 inches long, each spike setting 2 to 15 pods; petals connivent ¾ way up into a tube; pods coiled into a narrow straight cylindric body 1 to 1½ inches long; seeds less than 1 line long.

Sandy or gravelly washes or ravines, 200 to 2500 feet: Colorado and Mohave deserts; north to Death Valley. East to New Mexico. July.

Field note.—The trees, mostly 10 to 18 feet high, exhibit a single erect trunk or several such, the brownish bark on the main stem becoming stringy. When cut for fuel, for which purpose it is accounted rather inferior, the tree regenerates by crown-sprouts. Along the Mohave River, as at Barstow, this species with its dark foliage, produced in June, forms a grateful thread of green in the river bottom. In the Colorado River bottoms between Needles and Yuma it is more abundant than elsewhere in California. Just as in the case of other trees of "bottom" lands it suffers from floods. Like the Honey Mesquite, however, the cables in its root system are often 10 to 30 feet in length and serve well for anchorage. We watched the flood of January 17, 1916, come down the Mohave River from the San Bernardino Mountains into the desert. The waves sometimes ran as high as five feet from trough to crest; and, though Screw-bean thickets lay in the path of the heaviest currents, comparatively few trees were taken out of the river bottoms.

In the desert, miners and prospectors collect the pods of the Screw-bean Mesquite as a winter store, brown or roast them in an oven, grind them rather fine and use for the preparation of a beverage. These beans are regarded as an excellent substitute for coffee and the desert men are fond of the Screw-bean drink. The spikes set from 1 or 2 to 15 fruits.

Locs.—Panamint Valley (Contrib. U. S. Nat. Herb. 4:90); Furnace Creek, Funeral Mts., *Jepson* 6934; Tecopa, *Jepson;* Barstow, *Jepson* 4806, 6591, 6592; Colorado River, opp. Parker, *Jepson* 5233; Riverside Mts., Colorado River, *Jepson;* Palo Verde Valley, *Jepson.*

Refs.—Prosopis pubescens Benth.; Hook. Lond. Jour. Bot. 5:82 (1846), type loc. stated as "California between San Miguel and Monterey," *Coulter*, but undoubtedly collected far southeastward as were various of Coulter's spms. attributed to coastal Cal.; Jepson, Man. 514, fig. 514 (1925).

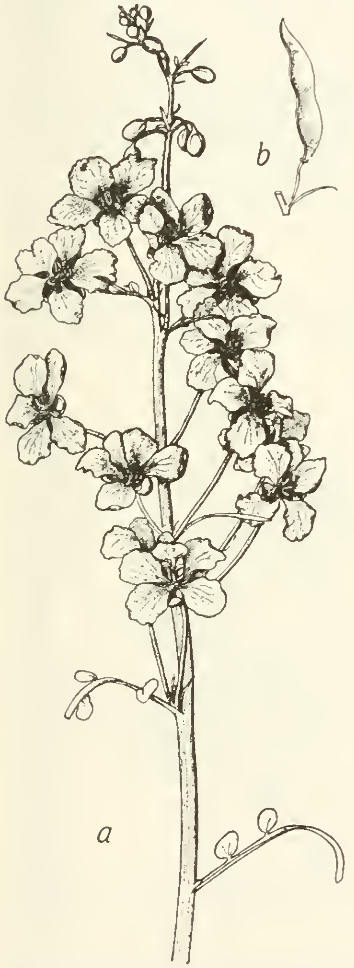

Fig. 175. Cassia armata Wats. *a*, fl. branchlet, × 5/8; *b*, fr., × 3/4.

5. **CASSIA** L. Senna

Herbs or shrubs with even-pinnate leaves. Flowers (in ours) yellow, in racemes. Sepals 5, distinct or nearly so. Corolla regular, with spreading petals. Fertile stamens (in ours) 7, the anthers opening by 2 pores at the apex, the 3 remaining stamens represented by short sterile filaments on the upper side of the flower. Pod usually curved, many-seeded.—Species 450, warmer regions, all continents except Europe. (Ancient Greek name.)

Herbage glabrous or nearly so; stipules and stipels none; racemes terminal.................................1. *C. armata.*
Herbage finely and densely white-pubescent; stipules and stipels filiform; racemes axillary........2. *C. covesii.*

1. **C. armata** Wats. (Fig. 175.) Much-branched bush 2 to 4 feet high; shoots of the season thickish, green, almost leafless, ending in racemes 3 to 7 inches long; leaf-rachis elongated, dilated, ending in a conspicuous point, bearing 1 to 4 pairs of leaflets; leaflets distant, oblong or ovate, 2 to 4 lines long; petals roundish, bright salmon-color, 4 to 6 lines long; pods often curved, 1 to 1½ inches long.

Sandy washes in the desert, 500 to 2000 feet: Colorado and Mohave deserts and north to Inyo Co. East to Nevada and western Arizona. May-June.

Field note.—The shoots of the season, dying back each summer and commonly bending over to the ground, are replaced the next year by new shoots. The bushes thus become broad—once to twice as broad as high and full of old dead stems which give the heart a black appearance. In the broad shallow washes of the central Mohave Desert the species is often abundant, forming the dominant vegetation. Flowering, in the years of considerable rainfall, is luxuriant. There are thus presented to the eye of the traveler in the early part of the rainless season long streamers of bright yellow winding amongst the low hills, bands of color which are in striking contrast to the general grayness of the desert.

Locs.—Wagon Wash near Sentenac Cañon, e. San Diego Co., *Jepson;* Yaqui Well, w. Colorado Desert, *Jepson* 12,519; Borrego Spr.; Santa Rosa Mts. (cañons on desert side), *Clary* 812; Chuckwalla Mts., *Schellenger;* Beals Well, 11 mi. e. of Niland; Cañon Sprs., *Hall* 5843; Orocopia Mts.; Pleasant Valley, n. of Indio, *Jepson;* Pinto Basin, nw. of Cottonwood Spr., *Jepson;* Warrens Well, *Parish:* Needles; Sheephole Mts.; Ludlow, *Jepson* 5500; Barstow, *Jepson* 4775, 5897; Randsburg: Red Rock Cañon; Haloran Spr., e. Mohave Desert, *Jepson* 15,796; Salt Well, Inyo Co.

Refs.—Cassia armata Wats. Proc. Am. Acad. 11:136 (1876), type loc. Mohave Desert between Ft. Mohave, Ariz., and Cajon Pass, Cal., *Cooper;* Jepson, Man. 512, fig. 511 (1925). *Xerocassia armata* Britt. & Rose, N. Am. Fl. 23:246 (1930).

2. **C. covesii** Gray. Bush 1 to 2 feet high; leaf-rachis short, bearing 3 pairs of leaflets; leaflets elliptic, 6 to 12 lines long; racemes few-flowered, corymbose, 1 to 2 inches long; petals oblong-obovate, veined, 6 lines long; pods straight or nearly so, 1 inch long.

Sandy washes, 1600 to 1800 feet: Colorado Desert. East to Arizona, south to Lower California. May-June.

Locs.—Corn Sprs., Chuckwalla Mts., *Munz & Keck* 4862; Martinez Cañon, Santa Rosa Mts. (Bull. S. Cal. Acad. 22:9); Wagon Wash near Sentenac Cañon, e. San Diego Co., *Jepson* 12,499; Sentenac Valley, *Jepson* 8779; Box Cañon, Mason Valley, *Jepson* 8665. San Gregorio, L. Cal. (Proc. Cal. Acad. ser. 2, 2:152,—1889).

Refs.—Cassia covesii Gray, Proc. Am. Acad. 7:399 (1868), type loc. Camp Grant, s. of Prescott, Ariz., *Coues, Palmer;* Jepson, Man. 512 (1925).

6. CERCIDIUM Tul.

Shrubs or small trees, armed with short axillary thorns. Leaves bipinnate with very short petiole bearing one pair of pinnae, each pinna with 2 or 3 equal pairs of leaflets. Flowers on jointed pedicels in axillary racemes. Petals yellow, clawed, the upper one broader than the rest, a little auricled at base of blade, and with longer claw. Stamens 10, distinct, the filaments hairy at base. Pod linear or oblong, flattish.—Species 6, southwestern North America and south along the Andes to Chile. (Greek kerkidion, a weaver's shuttle, in reference to the fruit.)

1. **C. torreyanum** Sarg. Palo Verde. (Fig. 176.) Tree 15 to 20 feet high, with short trunk and smooth green bark, leafless for most of the year; leaflets obovate or elliptic, 2 to 4 lines long; flowers 6 to 9 lines broad; pods 1½ to 4 inches long, often conspicuously constricted between the flat seeds; seeds quadrate, 3 to 5 lines long.

Sandy washes, sandhills or depressions in the deserts, sometimes on mesas, 100 to 500 feet: Colorado Desert. Southern Arizona to Sonora and Lower California. Apr.-May.

Habit.—A remarkable tree, especially as found in the desert washes, when young often extremely symmetrical, in age with highly irregular or broken crown, it is in either case a striking object in the desert landscape when covered by its drooping flower masses of a fresh and sensitive yellow. The long vegetative branches are usually very thorny. The scanty foliage is dropped early or held in whole or in part through the dry season. In either case the bark gives a marked color to the crown which thus makes light-green spots on the arid hills which, along the lower Colorado River,

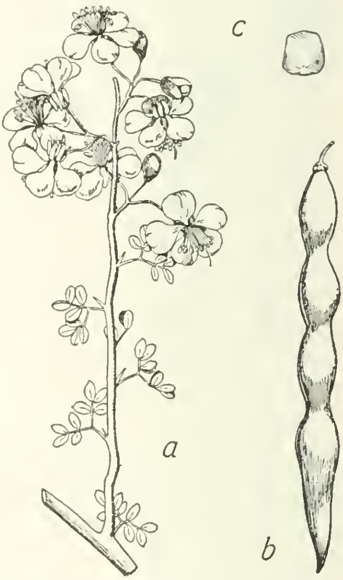

Fig. 176. Cercidium torreyanum Sarg. *a*, fl. branchlet, × ½; *b*, pod, × ½; *c*, seed, × ½.

sometimes bear open woodlands of this species. In the Palo Verde Valley a tree measured in 1912 was 33 feet high and 16⅓ inches in trunk diameter at one foot. It represented the average size of the larger trees.

Locs.—Palm Sprs. of San Jacinto, *Jepson* 8917; Coachella, *Clary;* Shavers Well, ne. of Mecca, *Jepson* 12,545; Painted Cañon, n. Colorado Desert, *Jepson* 11,684; Cottonwood Spr., Cottonwood Mts., *Jepson;* Fort Yuma, *Jepson;* Milpitas, Imperial Co., *Jepson* 5291; Riverside Mts., Colorado River, *Jepson* 5239; Whipple Mts., se. San Bernardino Co., *Jepson* 5224a. Ariz.: Cibola, *Jepson* 5273.

Refs.—CERCIDIUM TORREYANUM Sarg. Gard. & For. 2:388 (1889); Jepson, Silva Cal. 259 (1910), Man. 513, fig. 512 (1925). *Parkinsonia torreyana* Wats. Proc. Am. Acad. 11:135 (1876), type loc. lower Colorado River and valleys of s. and w. Ariz. *C. floridum* Torr. Pac. R. Rep. 5:360, pl. 3 (1853), not Benth. (1852).

7. PARKINSONIA L.

Shrubs or low trees. Leaves bipinnate, the common petiole very short, or almost none, bearing one pair of pinnae, each pinna with 4 to 25 pairs of leaflets. Flowers in loose racemes. Petals yellow. Stamens 10, distinct, in 2 rows, the filaments hairy below. Pod linear-cylindric, conspicuously constricted between the seeds.—Species 5, tropics and subtropics of the Americas and Africa. (James Parkinson, 1567–1650, author of botanical treatises and herbalist to James I.)

1. **P. microphylla** Torr. MALE PALO VERDE. Shrub 5 to 10 feet high or a small tree up to 25 feet high, with yellow-green bark; branchlets spinose at tip; pinnae ¼ to 1 inch long, in sessile pairs, the common petiole short or none; leaflets 3 to 8 pairs, elliptic, ½ to 1 line long; petals pale yellow, 2 to 2½ lines long; pods 1½ to 3 inches long, 1 to 3-seeded, strongly constricted between the seeds and the constrictions sometimes elongated, beaked with a long-acuminate apex and contracted at base into a cuneate stipe.

Gravelly hills and washes, 50 to 1000 feet: along Colorado River. East to Arizona and northern Mexico. Apr.-May.

In California the Male Palo Verde is confined to the neighborhood of the Colorado River. Journeying down the Colorado River in October 1912, we first noticed it at Brannan's Landing, Whipple Mts. (*Jepson* 5224), southeastern San Bernardino Co. After we passed the mouth of Bill Williams Fork it became, the next day, more frequent on the arid conical hills, forming spots of a singular somewhat scum-like yellowish green. On the Arizona shore it was collected at Cibola (*Jepson* 5272).

Refs.—PARKINSONIA MICROPHYLLA Torr. Pac. R. Rep. 4:82 (1857), type loc. "banks of Colorado and on Williams River," *Bigelow;* Jepson, Man. 513 (1925). *Cercidium microphyllum* Rose & Jtn. Contrib. Gray Herb. 70:66 (1924).

8. HOFFMANSEGGIA Cav.

Herbs or low shrubs, the stems from tuberous roots or a woody base. Leaves bipinnate, glandular-dotted, with very small leaflets and small stipules. Flowers and fruit more or less glandular. Flowers yellow, in naked racemes. Calyx 5-parted, the lobes nearly equal. Petals and stamens perigynous, inserted at the summit of the short calyx-tube. Petals 5, obovate, oval or oblong, nearly equal. Stamens 10, distinct. Ovary subsessile. Pod flat, with few or several seeds.—Species 20, western North and South America, South Africa. (J. Centurius, Count of Hoffmansegg, 1766–1849, author, with H. F. Link, of a Flora of Portugal.)

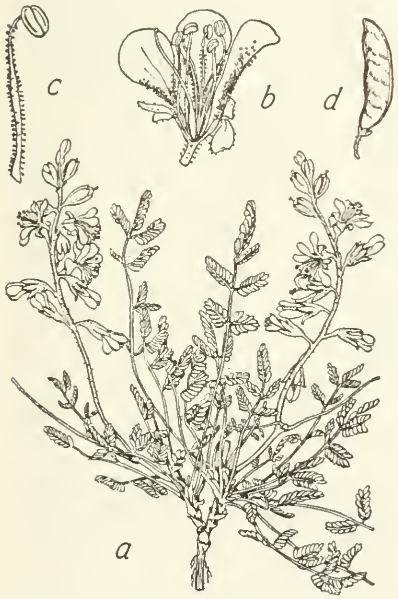

Fig. 177. HOFFMANSEGGIA DENSIFLORA Benth. *a*, habit, × ½; *b*, long. sect. of fl., × 1½; *c*, stamen, × 3; *d*, pod, × ½.

Herb; leaves with several pairs of pinnae..........1. *H. densiflora.*
Shrub; leaves with only one pair of pinnae besides the terminal pinna..........2. *H. microphylla.*

1. **H. densiflora** Benth. CAMOTE DE RATON. (Fig. 177.) Stems few or several from deep-seated roots, 2 to 12 inches high, with a tuft of mostly basal leaves; leaves bipinnate, 3 to 5 inches long, with commonly 3 to 5 pairs of pinnae, the pinnae 3 to 9 lines long; leaflets oblong, 1 to 3 lines long; flowers 5 lines long; corolla orange-red; lower margins of petals and the claws with many stipitate glands; filaments puberulent, the alternate ones less heavy or glandular than the others; ovary densely covered with tack-shaped glands; pods ¾ to 1½ inches long, straight on the ventral suture.

Hard alkaline spots, 500 to 2000 feet: head of the San Joaquin Valley; Mohave and Colorado deserts. South to Lower California and Mexico, east to Texas. Apr.-June.

Note on migration.—In Southern California Hoffmanseggia densiflora appears to be migrating to some extent, more especially entering cultivated areas. Parish (Bull. S. Cal. Acad. 19^4:19) records its appearance at Alhambra in 1896 and it has been collected at Los Angeles by T. Minthorn, in 1909. In 1922 W. S. Childs writes: "it is spreading rapidly over our cultivated fields at Brawley". Along the highway from Desert Center to Blythe, Hoffmanseggia keeps close to the road, suggesting its recent spread there from interstate traffic by highway vans. Doubtless, too, the Rosedale station in the San Joaquin Valley resulted from human agency.

Locs.—Rosedale, Kern Co., *Davy* 2928; Barnwell, *J. W. Connor, Jepson* 5465; Piute Creek, e. Mohave Desert, *N. C. Wilson;* Blythe, Palo Verde Valley, *Jepson* 5265; Palm Springs of San Jacinto, *Peirson;* San Felipe, *S. B. & W. F. Parish* 1410; Imperial, *F. H. Wales;* Brawley, *W. S. Childs.*

Refs.—HOFFMANSEGGIA DENSIFLORA Benth.; Gray, Pl. Wright. 1:55 (1852), type loc. valley of the Pecos, Tex., *Wright;* Jepson, Man. 516 (1925). *H. stricta* Benth.; Gray, l.c. 1:56, type loc. Zacatecas, Mex., *Coulter. Larrea densiflora* Britt. N. Am. Fl. 23:311 (1930). *H. falcaria* of Mo. Bull. Cal. Dept. Agr. 13:167 (1924).

2. **H. microphylla** Torr. (Fig. 178). Bush 2 to 10 feet high, with rush-like stems; leaves ¾ to 1¼ inches long, with one pair of lateral pinnae 2 to 5 lines long, the terminal pinna twice as long; racemes 4 to 5 inches long; flowers 4 lines long; filaments hairy at base; ovary with its margins and style densely hairy; pods oblong-falcate, 8 to 9 lines long.

Desert flats or banks of washes, 100 to 4000 feet: Inyo Co.; Colorado Desert. South to Lower California and Sonora, east to Arizona. Apr.

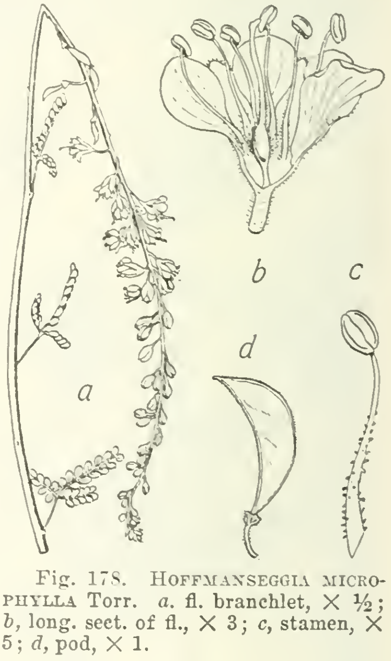

Fig. 178. HOFFMANSEGGIA MICROPHYLLA Torr. *a.* fl. branchlet, × ½; *b*, long. sect. of fl., × 3; *c*, stamen, × 5; *d*, pod, × 1.

Locs.—Independence, *Peirson;* Shavers Well, *J. T. Howell* 3307; Painted Cañon, n. of Mecca, *Jepson* 11,634; Dos Palmas; Coachella, *Greata* 428; Indio, *Davy* 7936; Palm Sprs. of San Jacinto, *Parish* 4114; Carrizo Creek, *T. Brandegee;* Calexico, *Davy* 8001.

Refs.—HOFFMANSEGGIA MICROPHYLLA Torr. Bot. Mex. Bound. 58 (1859), type loc. Colorado Desert, *Schott;* Jepson, Man. 516 (1925). *Larrea microphylla* Britt. N. Am. Fl. 23:310 (1930).

9. THERMOPSIS R. Br.

Perennial herbs (resembling Lupinus) with commonly erect clustered stems. Leaves palmately 3-foliolate, petioled, and with free leaf-like stipules. Flowers yellow, in a terminal raceme, the pedicels subtended by persistent bracts. Calyx campanulate, deeply toothed, the two upper teeth in ours almost completely united.

Banner roundish, shorter than the oblong wings, the sides reflexed; keel nearly straight, obtuse, its petals very lightly joined, equaling the wings. Stamens distinct. Pod long, linear, flat, several-seeded.—Species 12, North America and Asia. (Greek thermos, lupine, and opsis, resemblance.)

Herbage glabrous; pedicels equaling or twice as long as bracts..........1. *T. montana.*
Herbage densely pubescent or tomentose; pedicels commonly shorter than bracts..........
2. *T. macrophylla.*

1. **T. montana** Nutt. var. **venosa** Jepson comb. n. Stems branching, 1½ feet high; herbage glabrous; leaflets obovate to oblong, 1¼ to 2⅓ inches long; petioles ¾ to 1¾ inches long; stipules ovate or oblong, obtuse or acutish, longer or shorter than the petioles; racemes loose, the flowers solitary or in 2s in the axils of the bracts; pedicels ¼ to 1 inch long, equaling or longer than the bracts; pods linear, 2 to 3 inches long, on stipes shorter than the calyces.

Montane slopes, 1200 to 5500 feet: Trinity and Shasta Cos. Apr.-June.

Locs.—Little East Weaver Creek, Trinity Co., *H. S. Yates* 337; Carrville, Trinity Co., *Rose;* Trinity Mts., w. Shasta Co., *Blasdale;* Kennett, Shasta Co., *Blankinship.*

Refs.—THERMOPSIS MONTANA Nutt.; T. & G. Fl. 1:388 (1840), type loc. "high vallies of the Rocky Mts.", *Nuttall.* Var. VENOSA Jepson. *T. venosa* Eastw. Bull. Torr. Club 32:198 (1905), type loc. Lewiston Trail near boundary between Trinity and Shasta Cos., *Eastwood. T. gracilis* var. *venosa* Jepson, Man. 515 (1925). *T. gracilis* Howell, Erythea 1:109 (1893), type loc. mts. of sw. Ore. (near Waldo), *Howell,* is like T. montana Nutt. save that the herbage is puberulent.

2. **T. macrophylla** H. & A. Stems somewhat branched above, 1 to 2 feet high; leaves silky- or whitish-pubescent when young, soon glabrate, at least above; leaflets broadly or narrowly obovate and often more or less rhomboidal, acute at each end, or some obtuse at apex (even on same plant), 1½ to 3 or 4 inches long; stipules strongly oblique or not at all oblique, even on the same plant, longer than the petioles; upper lip of calyx slightly notched; lower calyx-teeth shorter than or as long as tube; raceme rather dense, 3 to 6 inches long; pods straight, silky, 2 to 5-seeded, 1½ inches long.

Open grassy places, forming small colonies on hill slopes or valley flats, 25 to 3000 feet: Coast Ranges, mostly toward the coast, from Los Angeles Co. to Mendocino Co. Also in southwestern Oregon. Apr.-June.

Locs.—Manzana, Antelope Valley, *Davy* 2490; San Emigdio Potreros; Pozo, San Luis Obispo Co., *Eastwood* 15,140; Monterey, *Brewer* 704; Glenwood, Santa Cruz Mts., *Horace Davis;* Mt. Hamilton, *Jepson* 4229; Crystal Springs Lake, San Mateo Co., *Elmer* 4824; Angel Island, *Davy* 6907; South Los Guilicos, Sonoma Co., *Bioletti;* Union sta., lower Napa Valley, *Jepson* 13,584; Knoxville, ne. Napa Co., *C. F. Baker* 3081; Conn Valley, Napa Range, *Jepson* 10,329; Jerusalem Valley, s. Lake Co., *Jepson* 9034; Ukiah, *Carl Purdy;* Willits, *Davy & Blasdale* 5095; Mendocino, *H. E. Brown.* Sw. Oregon: Mt. Emily, Curry Co., *Tracy* 5909.

Var. **argentata** Jepson comb. n. One to 2 feet high, densely silky-pubescent throughout.—Eastern Shasta Co. and southwestern Modoc Co., 3000 to 5000 feet.

Locs.—Dana, e. Shasta Co.; Big Valley Mts., Modoc Co., *M. S. Baker;* Egg Flat, Forestdale, *M. S. Baker;* Egg Lake, *Baker & Nutting.*

Var. **semota** Jepson var. n. Stems branching above the base, 8 to 15 inches high; herbage with a dense velvety almost shaggy pubescence; leaflets small, mostly rhomboidal, (¾ to 1¾ inches long); raceme 1 to 3 (or 4) inches long, dense.—(Caules super basim ramosi, unc. 8–15 alti; herbae dense, fere hirsuto-pubescentes; foliola parva, plerumque rhomboidea (unc. ¾–1¾ longa); racemi densi, unc. 1–3 (vel 4) longi.)—Cuyamaca Mts., Southern California.

Locs.—Julian, San Diego Co., *T. Brandegee;* Spencer Valley, *R. D. Alderson* (type).

Refs.—THERMOPSIS MACROPHYLLA H. & A. Bot. Beech. 329 (1840), type from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. 289 (1901), ed. 2, 215 (1911), Man. 515, fig. 516 (1925). *T. californica* Wats. Proc. Am. Acad. 11:126 (1876), type loc. Corte Madera, Marin Co., *Bigelow. T. californica* var. *velutina* Greene, Erythea 1:81 (1893), type loc. Mt. Hamilton, *Greene. T. velutina* Greene, Erythea 3:19 (1895), excluding plants of San Diego Co. *T. robusta* Howell, Erythea 1:109 (1893), type loc. Cal. Coast Range near Oregon boundary (Del Norte Co.), *Howell;* stout, 4 to 6 feet high (ex char.). Var ARGENTATA Jepson. *T. gracilis* var. *argentata* Jepson, Man. 515

(1925). *T. argentata* Greene, Erythea 3:18 (1895), type loc. Modoc Co. (Egg Flat, Forestdale), *M. S. Baker.* Var. SEMOTA Jepson. *T. gracilis* var. *velutina* Jepson, Man. 515 (1925), in great part.

10. PICKERINGIA Nutt.

Very rigid and spiny evergreen xerophytic shrub. Leaves small, palmately 1 to 3-foliolate, nearly sessile and without stipules. Flowers large, purple, solitary, axillary and short-pediceled. Calyx campanulate with a turbinate base, the border with 5 very low broad teeth. Petals equal, the banner orbicular with reflexed sides, the wing- and keel-petals oblong, the latter distinct and straight. Stamens distinct. Pod linear, flat, stipitate, straight, several-seeded.—Species 1. (Charles Pickering of the Wilkes Expedition, which visited California in 1841.)

1. **P. montana** Nutt. PEA CHAPARRAL. Densely branched shrub 3 to 10 feet high, the branchlets very spinose; leaflets obovate, entire, 2 to 6 lines long; flowers near the ends of the branchlets, rose-purple, ¾ inch long, on very short pedicels; pedicels bearing 2 minute subulate bractlets near the middle; banner with a yellowish or whitish spot at base; stamens persistent; pods exserted on the stipes, about 2 inches long, 6 to 10-seeded, somewhat constricted between the seeds.

Dry rocky mountain slopes, 1000 to 5000 feet: common from Mendocino Co. to Monterey Co.; thence south to San Diego Co., infrequent or rare; Sierra Nevada from Butte Co. to Nevada Co., highly localized. May-June.

Biol. note.—This species, one of the most xerophytic types of shrubs of the chaparral formation, often flowers abundantly but fruits very sparingly, mature pods usually being a rarity. The shrub crown-sprouts from the root-crown after a chaparral fire, but not ordinarily from the trunk-stem. Leafy shoots are also developed from the roots whenever these are exposed by being uncovered, as on a landslip, or road or trail. Shrubs with albino flowers have been observed near Santa Rosa (*Grace Elmore*) and on Greninger Creek in the Santa Cruz Mts. (*Jepson* 9692). In the latter case the shrubs grew on a graded cut in the hills and undoubtedly arose from the mutilated root system of older plants. The bank above the cut was crowned with a thicket of the same species, the flowers deep red.

Locs.—Coast Ranges: Indian Valley, ne. Lake. Co., *Jepson* 9024; Miyakma Range (e. of Ukiah), *Jepson* 2249; betw. Adams Sprs. and Glenbrook, *Jepson;* Knoxville ridge, *Jepson;* Vaca Mts., *Jepson* 13,586; Mt. St. Helena (Erythea 7:107); Rebecca ranch grade sw. of Calistoga, *Jepson;* Howell Mt., *Jepson* 2439; Mt. Tamalpais, *Jepson* 5712, 6189; Moraga Ridge, Oakland Hills, *Jepson;* Donner Cañon, Mt. Diablo, *Jepson* 7574; Los Gatos, ridge w., *Heller* 7426; Greninger Creek, w. of Gilroy, *Jepson* 9692; Pajaro Hills, *Chandler* 379; Arroyo Hondo trail, Santa Lucia Mts., *Jepson;* San Luis Obispo, *L. E. Roadhouse.* Sierra Nevada: Sugarloaf Mt., Nevada City, *Knower Mills;* You Bet, w. of Dutch Flat, acc. *L. S. Smith.* S. Cal.: Santa Inez Mts. (Bull. N. Y. Bot. Gard. 6:389); Santa Cruz Isl. (Zoe 1:134); Laurel Cañon, Los Angeles (Proc. S. Cal. Acad. 1:8); City Creek road, San Bernardino Mts., *Parish* 4909.

Var. **tomentosa** Jtn. Herbage densely puberulent.—Mountains of eastern San Diego Co.: Jamul, *Palmer;* Dulzura, *Valentine;* El Nido, *Abrams* 3530.

Refs.—PICKERINGIA MONTANA Nutt.; T. & G. Fl. 1:389 (1840), type loc. summits of mountains near Santa Barbara, *Nuttall;* Jepson, Fl. W. Mid. Cal. ed. 2, 215 (1911), Man. 515, fig. 517 (1925). *Xylothermia montana* Greene, Pitt. 2:188 (1891); Jepson, Fl. W. Mid. Cal. 290 (1901). Var. TOMENTOSA Jtn. Contrib. Gray Herb. 68:84 (1923). *Xylothermia montana* subsp. *tomentosa* Abrams, Bull. Torr. Club 34:263 (1907), type loc. near El Nido, San Diego Co., *Abrams* 3530.

11. LUPINUS L. LUPINE

Herbs or shrubs. Leaves palmately compound; leaflets 3 to 17. Flowers showy, blue, pinkish, yellow or white, in terminal racemes or spikes. Calyx deeply 2-lipped, often with small bractlets between the lips. Banner commonly with a median groove, the sides mostly reflexed; wings commonly connivent by their edges in front of and thus enclosing the mostly falcate pointed keel. Stamens monadelphous, dimorphous, 5 with longer and basifixed anthers, the alternate 5 with shorter and versatile ones. Pod somewhat flattened, often constricted between the seeds. Cotyledons thick and fleshy.—Species about 100, all continents except Australia, mostly North America. (Latin lupus, a wolf, these plants anciently thought to rob the soil of its fertility.)

Variation.—The representation of the genus Lupinus in California is large and variable. The natural units cannot readily be segregated because reliance can seldom be had on single or few characters. On the other hand individual plants, on the whole, fall somewhat readily into natural groups on the basis of the sum total of their characters. An intensive study of such natural groups reveals the features that are variables in greater degree, or variables in less degree, so that one gives proportionate weight to the various characters. By this method the confusion often evident in determining the systematic relationships of Lupines will to some extent be avoided, although in a few cases of complex groups it has been necessary to define the prevailing condition, the mean about which the whole group fluctuates, because it is not possible to establish sharply defined boundaries.

Habit is a fairly useful feature, although in certain cases it may be extremely variable. Lupinus albifrons Benth. departs from its usual shrub form (5 to 12 feet high) and becomes low and suffrutescent (var. collinus Greene) or even practically herbaceous (var. austromontanus Jepson). The open or congested habit of the foliage, the relative length of stems, peduncles and racemes are so dependent upon the conditions under which growth takes place that in most groups they are uncertain for use in segregation, even for the segregation of varieties. In the Lupinus lepidus group such characters and also size of flowers and denseness or laxity of racemes have been generally used by authors for segregation. The plants, however, vary widely in these respects and show almost every possible combination of variations within the group. A similar range of variables is shown by Lupinus concinnus Agardh and L. sparsiflorus Benth. A complete recognition of such variations as species or even as varieties would extend the systematic account far beyond the point of usefulness. In such a complex the prevailing form is given specific standing, the more definite or striking local races recognized as varieties.

In some groups the plants are to all appearances so readily stimulated by the environmental factors in a territory apparently recently occupied, that the characters which serve to define the species in its typical phase, fail altogether to characterize the less stable phases. The group Lupinus albicaulis in its extreme form, L. formosus Greene, reaches a stable phase on the floor of the Great Valley as to robust habit, density of pubescence, length of racemes and the size and shape of the banner, wings and keel of the flower; but on the margins of the range of L. formosus in the foothills the representatives of the group are highly variable. Thus in the case of certain of these variants every character utilized to set apart typical L. formosus from typical L. albicaulis has been lost. Satisfactory key characters in such groups are obviously not to be had.

Technical floral characters have been depended upon hitherto more than is justifiable. Ciliation of the keel is useful in certain cases, but implicit reliance upon it leads to confusion. Lupinus albifrons Benth. and L. bicolor Lindl. both have a characteristically ciliate keel, but variants occur in each in which the keel is non-ciliate. Lupinus concinnus Agardh has a non-ciliate keel, but has also local races with the keel ciliate as in L. sparsiflorus Benth. In Lupinus microcarpus Sims the keel may be ciliate on both margins, on either or neither. The shape of the banner is similarly variable and neither the banner nor keel ciliation serve for the segregation of species or even varieties. Calyx characters are often in like case. In Lupinus microcarpus the lower lip of the calyx may vary from broadly oblong to narrowly lanceolate, from entire through all gradations to deeply bifid or trifid, and the upper lip from entire to bifid. When this character is utilized for varietal segregation it results in artificial groupings. Even local races and plants of one form in a small area, as in the Richmond district, may vary widely in this respect. The calyx character is similarly unreliable in L. bicolor Lindl. and L. micranthus Dougl.

The seeds of many lupines are beautifully and strikingly patterned; they also differ widely in size and shape and it is possible that a more complete knowledge of them would be of value in determining relationships.

Field note.—Some lupine species are undoubtedly poisonous to cattle, horses or sheep, but experimental investigation of Californian species thus far is not in every case conclusive. Perhaps only a few species are involved and probably it is, in most cases, the seeds which produce unfavorable symptoms. The herbage of the annual lupines, such as Lupinus bicolor, often forms a considerable or even major portion of cut hay in certain portions of the Great Valley and is freely used in all stages of growth for fodder. We have noticed that riding animals of one's botanical pack train when on the trail eagerly eat tufts of the herbage of Lupinus albifrons. Sheep men in the Sierra Nevada on the watershed of the San Joaquin River value the mature or naturally dried herbage of Lupinus albicaulis for their flocks. On the other hand we have often observed the general herbage of meadows, cañon flats or cupped hollows in the Sierra Nevada cropped close to the ground, but spotted by dense colonies of Lupinus rivularis left untouched by horned cattle, or on the whole little disturbed, either in flower or in fruit. The seeds of Lupinus microcarpus are sometimes harvested on the upper San Benito River benches and fed to barnyard fowl, the settlers believing that egg production is thereby stimulated. The mourning dove feeds extensively upon the seeds of Lupinus bicolor and doubtless other annual species. In the Great Valley Lupinus formosus is sometimes troublesome as a weed in rich fields. So far as observed all our shrubby species are evergreen. Of these shrubby species one, Lupinus arboreus, is especially valuable as a covering on shifting hills of sand along the California coast. For this use it has been introduced into other countries and is even more valuable than at home. Leonard Cockayne of New Zealand informs us that, next to Ammophila arenaria Link, Lupinus arboreus is the most important plant for dune reclamation in his country (Jepson Corr. 27:35 ms.). It is not, however, a sand-binder and should be used for sand-covering only where there is a well-fixed Ammophila arenaria (Beach Grass) area to the windward. By laying pod-bearing branchlets, just before the pods are ready to break, on the bare dune, it is found that the branchlets prevent movement of the sand, after which the germinating seedlings cover the ground with a close growth (L. Cockayne, Dune Areas of New Zealand 44, 49, 68).

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A. Cotyledons petioled after germination; ovules 2 to 12 or more.

I. PLANTS PERENNIAL.

1. Pedicels slender, usually 1½ to 6 lines long; bracts usually caducous or early deciduous.

a. Apex of banner reflexed from the tips of the wings, the corolla therefore as if notched above; median groove of banner usually shallow, covering but little of the wings.

Shrubs or bushes, evergreen.
Hills and mountains, not on the ocean shores.
Leaves silvery-silky.
Common, Coast Ranges, west slope Sierra Nevada, infrequent in cismontane Southern California and the desert slopes bordering it..........1. *L. albifrons.*
Relatively rare, Inyo Co..........2. *L. excubitus.*
Leaves greenish sub-silky; cismontane Southern California..........3. *L. longifolius.*
Sea-beaches, sand-dunes and bluffs along the coast line.
Keel non-ciliate; petals commonly blue..........4. *L. chamissonis.*
Keel ciliate; petals commonly yellow..........5. *L. arboreus.*

Herbs.
Keel non-ciliate.
Stems stout and usually hollow.
Leaflets 9 to 17, 3 to 6 inches long; racemes dense..........6. *L. polyphyllus.*
Leaflets 5 to 10, 1¼ to 3¼ inches long; racemes mostly lax..........7. *L. superbus.*
Stems not hollow.
Leaves greenish, only slightly pubescent; stems commonly strictly erect; banner acute or sometimes obtuse; montane slopes or montane valleys..........8. *L. albicaulis.*
Leaves densely pubescent, often silky; stems typically decumbent or ascending; banner broad, commonly obtuse; typically of low valley floors and cañon flats..........9. *L. formosus.*
Keel more or less ciliate.
Plants of the immediate coast line; banner glabrous.
Roots yellow; species of sea beaches, strictly littoral.
Stipules 3 to 5 lines long..........10. *L. littoralis.*
Stipules about 1 line long..........11. *L. tidestromii.*
Roots not yellow; species of grassy fields and sand-dunes..........12. *L. variicolor.*
Plants of mountains and valleys.
Keel ciliate, but not the acumen; banner glabrous; stems very tall (2 to 5 feet), several in a clump; widespread..........13. *L. rivularis.*
Keel ciliate from near apex to middle.

Leaflets glabrous or obscurely pubescent above, at least not silky; racemes with the flowers scattered; banner glabrous; e. and n. of the northern Sierra Nevada........14. *L. saxosus.*

Leaflets silky-pubescent or silky-tomentose.

Stems very leafy up to the racemes; high montane.

Banner glabrous; racemes 6 to 7 lines wide; flower whorls usually many; central and northern Sierra Nevada........15. *L. meionanthus.*

Banner silky on the back; racemes ¾ to 1¼ inches wide; flower whorls 4 to 7; northern peaks........16. *L. ornatus.*

Stems with the leaves chiefly basal or sub-basal (the proper stems short); banner glabrous on the back or nearly so.

Largest leaflets 5 to 13 lines wide; local in the Coastal Ranges.

Leaflets retuse or truncatish, the pubescence silky above, below, and on the margins; St. Helena and Mayacamas ranges........17. *L. sericatus.*

Leaflets obtuse or subacute, the pubescence finely short-silky, the margins hirsute-ciliate; Santa Lucia Mts........18. *L. cervinus.*

Largest leaflets 2 to 5 (or 6) lines wide.

Flowers 6 to 7 lines long; peduncles 2 to 4½ inches long; Sierra Nevada, west slope........19. *L. grayi.*

Flowers 8 to 8½ lines long; peduncles about 1 foot long; desert species (Inyo Co.)........20. *L. magnificus.*

b. Apex of banner usually not much reflexed from tips of wings, the corolla therefore not appearing as if notched at apex or scarcely so; median groove of banner usually deep, covering the edges of the wings.

Plants not matted; keel more or less ciliate.

Stems diffuse or decumbent, simple, few-leaved, few-flowered, bearing dwarf branchlets in the primary leaf-axils; low or dwarfish plants 4 to 9 inches high; far northern Cal. 21. *L. onustus.*

Stems erect or ascending, more or less branching; dwarf branchlets none; banner more or less pubescent on back.

Calyx-cup spurred or gibbous; Sierra Nevada and Great Basin.

Calyx about ¼ to ⅓ as long as petals; spur or sac ¼ to ½ line long; herbage greenish, pubescent........22. *L. laxiflorus.*

Calyx about ½ to ¾ as long as petals; spur 1 line long; herbage silvery........23. *L. caudatus.*

Calyx-cup not spurred or gibbous; w. San Luis Obispo Co........24. *L. ludovicianus.*

Plants forming broad flat mats, the peduncles and racemes less than 6 inches high; high montane. 25. *L. breweri.*

2. *Pedicels stout, short, usually ½ to 1½ lines long; bracts usually persistent or tardily deciduous; racemes subspicate with flowers usually crowded; keel ciliate.*

Banner glabrous.

Largest leaves usually basal, long-petioled; leaflets mostly 3 to 12 lines long; montane or high montane, mostly Sierra Nevada.

Racemes short-cylindric or subcapitate, rarely more than twice as long as wide; peduncles and leaves basal or sub-basal, the peduncles usually curved or bent, spreading or decumbent........26. *L. lyallii.*

Racemes cylindric or elongated-cylindric, usually more than twice as long as wide; peduncles borne on leafy stems, the proper stems often very short....27. *L. lepidus.*

Largest leaves mainly cauline, mostly short-petioled; leaflets mostly 1½ to 4 inches long, narrow, acute.

Herbage with minute and closely appressed pubescence; peduncles elongated, surpassing the uppermost leaves; bracts and bractlets lanceolate; w. Inyo Co. or near its west borders........28. *L. pratensis.*

Herbage with long loose largely spreading hairs; peduncles short, not surpassing the uppermost leaves; bracts and bractlets linear or filiform; Sierra Nevada, west slope........29. *L. covillei.*

Banner pubescent on the back; leaflets mostly 1 to 3 inches long.

Leaflets obtuse; herbage finely and closely silky........30. *L. peirsonii.*

Leaflets acute; herbage white with shaggy-sericeous hairs........31. *L. leucophyllus.*

II. Plants annual or biennial.

1. Flowers in whorls.

Keel ciliate on upper margin between middle and apex, or (rarely) non-ciliate; flowers 1½ to 6 lines long; corolla bicolored, blue, the banner with a white or yellow center usually turning violet or purple; leaflets pubescent on upper surface, or at least slightly pubescent usually.

Keel slender with long narrow point (acumen).

Banner suborbicular or broader than long.

Keel non-ciliate; flowers 3 to 4 lines long; pedicels 1 to 1½ lines long; pods conspicuously broad, 3 to 4½ lines wide, 1 to 1⅓ inches long.......... 32. *L. pachylobus.*

Keel ciliate; flowers mostly 5 to 6 lines long; pedicels 1½ to 4 lines long; pods usually not conspicuously broad, 2½ to 3 lines wide, ¾ to 2 inches long...... 33. *L. nanus.*

Banner obovate-orbicular to elliptical, longer than wide; keel ciliate (or rarely non-ciliate); flowers 2 to 4 lines long; pods 5 to 12 lines long, 1½ to 3 lines wide...... 34. *L. bicolor.*

Keel blunt, ciliate; banner cuneate to spatulate; flowers 1½ to 3 lines long; pods 10 to 13 lines long, 2½ to 3 lines wide.......... 35. *L. micranthus.*

Keel ciliate on both upper and lower margins near the claw only; flowers 4½ to 8½ lines long; pods about 2 inches long; leaflets glabrous above.......... 36. *L. succulentus.*

2. Flowers not in whorls.

Racemes longer than peduncles; pods usually pubescent, constricted between the seeds.

Keel non-ciliate; racemes nearly sessile, usually exceeded by the foliage; flowers usually 3½ to 4½ (rarely 6) lines long; pods ascending, 2 to 4-seeded; plants densely pubescent.......... 37. *L. concinnus.*

Keel usually ciliate on lower margin near the claw, commonly also ciliate on upper margin near the claw (rarely non-ciliate); pods 2 to 8-seeded; seeds smooth.

Plants conspicuously and densely hispid with long yellow or brown stinging hairs; largest leaflets 7 to 12 lines wide.......... 38. *L. hirsutissimus.*

Plants not conspicuously hispid, the hairs shorter, not stinging; leaflets 1 to 6 lines wide.

Keel stout and blunt, always densely ciliate on most of upper margin, more or less ciliate on lower margin near the claw; leaflets linear-cuneate, truncate, 2 or 3-toothed at the apex; petioles flattened.......... 39. *L. truncatus.*

Keel with slender acumen, sparsely ciliate or non-ciliate on upper margin, ciliate or (rarely) non-ciliate on lower margin near claw; leaflets filiform or broader; petioles not flattened.

Pods ascending, pubescent; petals blue to purple.

Leaflets linear-filiform, usually 1¼ to 2 inches long; bracts linear, dense and densely hairy, the raceme in bud forming a conspicuous plume; keel very slender, falcate, always non-ciliate on upper margin.......... 40. *L. benthamii.*

Leaflets linear or broader, ¼ to 1 inch long; bracts not conspicuous on young racemes; keel broader, not falcate, ciliate or non-ciliate on either margin.......... 41. *L. sparsiflorus.*

Pods deflexed, becoming glabrate; petals orange or white, keel ciliate on lower margin only; pods 2 to 4-seeded.......... 42. *L. citrinus.*

Racemes shorter than peduncles, few-flowered, subcapitate in early anthesis; flowers 7 to 8 lines long; banner yellow, wings rose-pink; keel densely ciliate near the claw on both upper and lower margins; pods ascending, glabrous.......... 43. *L. stiversii.*

B. Cotyledons sessile, connate; ovules usually 2 only; annuals.

I. Flowers in whorls; keel more or less ciliate.

Leaflets glabrous above; stem not rigid, often hollow; petals white, yellow, pink or purple.......... 44. *L. microcarpus.*

Leaflets pubescent on both sides; stem rigid, never hollow; petals yellow.......... 45. *L. luteolus.*

II. Flowers not whorled; keel non-ciliate; stems very short (mostly ¼ to 1 or rarely 3¼ inches long), the leaves and peduncles therefore basal or sub-basal.

Pods hairy on the margins, the sides quite glabrous or nearly so.

Racemes shorter than the leaves; calyx hairy, its lips subequal; pods minutely scaly on the sides; leaflets silky beneath, glabrous above.......... 46. *L. shockleyi.*

Racemes conspicuously exceeding the leaves; calyx glabrous (except in vars.), the lips unequal; pods smooth or scaly on the sides; leaflets glabrous or nearly so.......... 47. *L. odoratus.*

Pods hairy; calyx hairy or villous, its lips very unequal; racemes shorter than or equaling the leaves.

Pods constricted between the seeds, densely hirsute; racemes 1 to 2½ inches long; seeds flat, rugulose........48. *L. pusillus.*

Pods not constricted between the seeds; racemes at first subcapitate; seeds lenticular, polished........49. *L. brevicaulis.*

SECTION 1.—Perennials.

1. **L. albifrons** Benth. SILVER LUPINE. Rounded very leafy shrub 1½ to 5 (or 12) feet high, usually with a distinct woody trunk; herbage silky-pubescent, the leaves silvery-silky; leaflets 7 to 10, oblanceolate, ½ to 1 (or 1¼) inches long; petioles ½ to 1½ inches long; racemes loose or at least not dense, 3 to 12 inches long, the whorls definite or indefinite; flowers 5 to 7½ lines long; pedicels 1½ to 4 lines long; upper calyx-lip broad, cleft, the lower entire or toothed; petals blue, subequal; banner broad, the whitish or yellow spot early changing to red-purple, a little pubescent on middle of back near apex; keel minutely or sparingly ciliate; pods villous, 1 to 1¾ inches long, 5 to 9-seeded.

Sandy or dry loam, hillsides and cañons, 50 to 4000 (or 6700) feet: Coast Ranges from Humboldt Co. to Santa Barbara Co. Sierra Nevada from Shasta Co. to Tulare Co.; coastal Southern California. Mar.-July.

Geog. note.—One of the most abundant and widespread of our perennial Lupines, Lupinus albifrons is often gregarious on hillslopes and dominant over considerable areas. Crowded with long erect racemes, it is, with its silvery foliage, usually a striking object in the landscape of the hill country of the seaward Coast Ranges. Sometimes a cañon is all silver with a pure stand of the species. It is less common in the Sierra Nevada foothills, whence the seeds, however, are often carried down by freshets to the floor of the east side of the San Joaquin Valley, where considerable colonies occasionally grow on the river benches or flood beds of the Chowchilla River, Fresno River and other winter streams. Bushes in this region become 4 to 12 feet high, thus attaining the greatest size of any species in the genus so far as known to us. These remarkable plants of the valley floor were first observed in 1844 by Captain John C. Fremont who, on the east side of the San Joaquin Valley between the Calaveras and Stanislaus rivers, made note of them in his journal as follows: "About 1 o'clock we came again among innumerable flowers; and a few miles further, fields of the beautiful blue-flowering lupine, which seems to love the neighborhood of water, indicated that we were approaching a stream. We here found this beautiful shrub in thickets, some of them being 12 feet in height. Occasionally three or four plants were clustered together, forming a grand bouquet, about 90 feet in circumference, and 10 feet high; the whole summit covered with spikes of flowers, the perfume of which is very sweet and grateful. A lover of natural beauty can imagine with what pleasure we rode among these flowering groves, which filled the air with a light and delicate fragrance" (Rep. Expl. Exped. to Ore. and Cal. 249).

In coastal Southern California Lupinus albifrons is relatively rare but has developed a number of variants of special ecological interest in connection with their semi-arid or desert habitats. These are described below.

Note on variation.—Throughout its range Lupinus albifrons is recognizable as a well defined natural unit. Its abundant silvery leaves are quite constant in shape and size, and the sterile branchlets with small crowded leaves are often a characteristic feature. Minor variations have been made the basis of several specific segregates, which apparently have little significance either structurally or geographically. The plants in less favorable habitats are sometimes without distinct trunks, the branches more or less decumbent from a woody caudex (*L. collinus* Hel.). The pubescence of pedicels, spreading in the original plants, is sometimes appressed (*L. brittonii* Abrams, *L. eminens* Greene). Our material indicates that this condition is constant in the most northerly portion of the state and that it is more common at higher altitudes, but it occurs elsewhere, and there are many intermediates with pubescence sub-appressed or ascending. In certain plants from Marin and Monterey counties the floral bracts are long and conspicuous in the bud (*L. douglasii* Agardh). Large-flowered phases are common; color variations apparently less so. Albino and pink-flowered plants are sometimes observed in the field. The banner spot varies from white to yellow, changing after fertilization to violet or tawny red. The non-ciliate keel is occasional, but has not proved constant in any of the forms in which it has been utilized as a segregating character. In L. albifrons and the varieties douglasii and collinus the keel is narrow (1¼ to 2 lines wide), while in the varieties hallii, austromontanus and johnstonii it is broad (2½ to 3 lines wide). This distinction, though not invariable, is extremely constant. The specimens next cited are regarded as essentially representative of the species.

Locs.—Coast Ranges: Yreka, *Butler* 1268; Crane Creek, e. Tehama Co., *Jepson;* Weitchpek, n. Humboldt Co., *Chandler* 1424; Lassecks Peak, Humboldt Co., *Goddard* 659; Burr Creek, Humboldt Co., *Tracy* 4707; Mt. St. Helena, *Jepson;* Calistoga, *Jepson* 53t; Oakley, Contra

Costa Co., *Jepson* 15,724; Howell Mt., *Jepson* 35t; Caux's Cabin, w. of St. Helena, *Jepson* 54t; Berkeley, *Jepson* 7t, 3002; Colma Cañon, n. San Mateo Co., *Jepson* 9108; Tunitas Creek, San Mateo Co., *Jepson;* Cook, San Benito Co., *Jepson* 12,045; Bitterwater Valley, San Benito Co., *Jepson* 12,043; San Antonio trail (summit), Santa Lucia Mts., *Jepson* 1653; Zapato Chino Creek, sw. Fresno Co., *Jepson* 15,378. S. Cal.: Orcutt, Santa Barbara Co., *J. T. Howell* 2996; San Emigdio Cañon, *Davy* 2021; Santa Monica, *Barber* 23; Los Angeles (Erythea 6:71); Santa Catalina Isl., *K. Brandegee;* Jacumba, *Abrams* 3680. Sacramento Valley: South Peak, Marysville Buttes, *Jepson* 51t; College City, *Alice King.* Sierra Nevada: Stillwater, Shasta Co., *Baker & Nutting;* Rough and Ready, Nevada Co., *Jepson* 19t; Gwin Mine, Calaveras Co., *Jepson* 1768; Rawhide, Tuolumne Co., *A. L. Grant* 659; Table Mt., Fresno Co., *Jepson* 15,114; Kaweah, *Hopping* 259.

Var. **douglasii** C. P. Sm. Bracts conspicuously much exceeding buds; leaflets 1 to 1¾ inches long.—Mt. Tamalpais (*Chandler* 499); Carmel River (*Heller* 6590); Little Sur River, Monterey coast (*Jepson* 2605).

Var. **collinus** Greene. Low and caespitose; leaves crowded basally and petioles more elongated (1 to 2¼ inches long); flowers 6 to 8 lines long; keel nearly non-ciliate.—Hills, San Francisco Bay region: Lake Lagunitas, *Eastwood;* Angel Isl., *Davy* 4210; San Bruno Hills, *C. F. Baker* 1889; Mt. Hamilton, *Jepson* 4221, 8238.

Var. **hallii** Jepson comb. n. Bush; usually larger and coarser; flowers 7 to 9 lines long.—Cismontane Southern California, mostly away from the coast: Soledad Cañon, San Gabriel Mts., *Peirson* 3090; Mill Creek Cañon, San Bernardino Mts., *G. R. Hall;* San Bernardino, *Parish;* Alamos, Riverside Co., *Hall;* Anaheim, *C. F. Baker* 4102; Volcan Mts., San Diego Co., *T. Brandegee;* Descanso, *T. Brandegee.*

Var. **austromontanus** Jepson comb. n. Stems several from the root-crown, forming a tuft 1 to 2½ feet high, nearly herbaceous; leaves mostly basal or sub-basal; racemes 4 to 11 inches long.—Tehachapi Mts. to the San Gabriel Mts. and San Jacinto Mts.: Mt. Pinos, *Munz* 7048; Rock Creek, San Gabriel Mts., *Peirson* 522; Strawberry Valley, Mt. San Jacinto, *Jepson* 1312; Shays Well, s. Mohave Desert, *Jepson* 5952.

Var. **johnstonii** Jepson comb. n. Plants 4 to 14 inches high, congested, the proper stems very short or almost none and the leaves in a dense mainly basal or sub-basal tuft; racemes short (1 to 5 inches long).—Mountain or hill tops, 1300 to 6500 feet: San Bernardino Mts. (Bear Valley, *Parish* 3311); San Jacinto Mts.; Elsinore. This form merges inconstantly with var. austromontanus.

Var. **medius** Jepson var. n. Plants 2 feet high, the stems several from the root-crown; herbage finely white-tomentulose and with intermixed long hairs; racemes 8 to 13 inches long; flowers 5½ lines long, pedicels with spreading pubescence; keel narrow and sparsely ciliate on apical portion.—(Caules plures, ped. 2 alti; herbae minute albo-tomentulosae pilis longis intermixtis; racemi unc. 8–13 longi; flores lin. 5½ longi; pedicelli diffuse pubescentes; carina angusta, apice sparse ciliolata.)—Mountain Springs grade (at summit), eastern San Diego Co., *Jepson* 11,815 (type).

Refs.—LUPINUS ALBIFRONS Benth. Trans. Hort. Soc. ser. 2, 1:410 (1835), type cult., the seeds from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. 315 (1901), ed. 2, 217 (1911), Man. 531 (1925). *L. fallax* Greene, Erythea 2:119 (1894), type grown in the Univ. Cal. Botanic Garden, being a plant transplanted from Mt. Tamalpais, Marin Co., by W. L. Jepson (floral bracts long and conspicuous, ex char.). *L. albifrons* var. *eminens* C. P. Sm.; Jepson, Man. l.c. *L. eminens* Greene, Erythea 1:125 (1893), type loc. Santa Inez Mts., Santa Barbara Co., *G. W. Dunn* (June 7, 1891); Jepson, Fl. W. Mid. Cal. 315 (1901) as synonym. *L. acutilobus* Hel. Muhl. 8:111 (1912), type loc. East Butte, Marysville Buttes, *Heller.* *L. tricolor* Greene, Erythea 1:126 (1893), type cult. in Univ. Cal. Botanic Garden; seeds from Vaca Mts., Solano Co., *Jepson.* *L. jucundus* Greene, Man. Reg. S. F. Bay 106 (1894), a new name for L. tricolor Greene; Jepson, Fl. W. Mid. Cal. 315 (1901), as synonym. Var. DOUGLASII C. P. Sm.; Jepson, Man. 531 (1925). *L. douglasii* Agardh, Syn. Gen. Lup. 34 (1835), type doubtless from Cal., *Douglas.* Var. COLLINUS Greene, Fl. Fr. 46 (1891), type loc. Presidio, San Francisco, *Greene.* *L. collinus* Hel. Muhl. 2:292 (1907). Var. HALLII Jepson. *L. hallii* Abrams, Bull. Torr. Club 37:151, fig. 2 (1910), type loc. Reche Cañon, Riverside Co., *Hall.* *L. excubitus* var. *hallii* C. P. Sm.; Jepson, Man. 532 (1925). *L. paynei* Dav. Bull. S. Cal. Acad. 17:58 (1918), type loc. cañons of Tapo Ranch, Santa Susana, *T. Payne* 3305. *L. brittonii* Abrams, Bull. N. Y. Bot. Gard. 6:391 (1910), type loc. Cottonwood Valley, San Diego Co., *Abrams* 3904 (herbage glaucescent; pubescence of pedicels appressed, ex char.), is perhaps a form of var. hallii. Var. AUSTROMONTANUS Jepson. *L. excubitus* var. *austromontanus* C. P. Sm.; Jepson, l.c. *L. austromontanus* Hel. Muhl. 2:69 (1905), type loc. Tehachapi, Kern Co., *Heller* 7825. Var. JOHNSTONII Jepson. *L. excubitus* var. *johnstonii* C. P. Sm.; Jepson, l.c., based on plants from "Ventura and San Bernardino Cos." Var. MEDIUS Jepson.

2. **L. excubitus** Jones. GUARD LUPINE. Bush 2 to 4 feet high; herbage densely white-silky; leaflets oblong-oblanceolate, obtuse but apiculate, ¾ to 1½ inches long, the petioles 1 to 3½ inches long; racemes rather loose, 3 to 10 inches long, long-

pedunculate, the flowers scattered or subverticillate; flowers "fragrant", 4 to 7 lines long; pedicels 2 lines long; calyx-lips somewhat unequal, the upper shortly cleft, the lower 3-toothed, or sometimes only obscurely so; petals blue, pale lavender or white, the banner with a yellow center changing to dark violet or dark purple; keel ciliate; pods densely pubescent, 1 to 1½ inches long, 5 to 8-seeded.

Flood beds of streams and washes, and on tilted mesas, 2600 to 6600 feet: Inyo Co. May-June.

Field note.—In the desert cañons of the Panamint Range, opening into Death Valley from the west, this floriferous species, at about 3500 to 4000 feet, is seen in its best development. The bushes, 3 to 4 feet high and 4 to 8 feet broad, are in May crowned each with hundreds of racemes and make a fine spectacle in the washes and on the neighboring hill-slopes. The pale lavender-blue flowers, borne in long racemes, are elevated on rather long peduncles and add to the happiness of the specific name.

Locs.—Lone Pine, *K. Brandegee;* Lone Pine Creek, *Hall & Chandler* 7198; Big Pine (10 mi. ne.), *Keck* 542; Shepherds Cañon, Argus Mts., *Jones;* Nelson Range, *Hall & Chandler* 7151; Panamint, *Ferris* 7961; Hanaupah Cañon, w. side of Death Valley, *Jepson* 6950, 7102.

Refs.—LUPINUS EXCUBITUS Jones, Contrib. W. Bot. 8:26 (1898), type loc. gravelly mesas (7000 ft.), Lone Pine, Inyo Co., *Jones;* Jepson, Man. 532 (1925).

3. **L. longifolius** Abrams. PAUMA LUPINE. (Fig. 179.) Erect bush 2½ to 5 feet high, the erect seasonal shoots from woody stems ½ to 1½ feet high; herbage appressed-pubescent, the leaflets greenish, sub-silky; leaflets 6 to 9, linear- or oblong-oblanceolate, 1 to 2 inches long; petioles 1¼ to 4 inches long; racemes loose, 5 to 15 inches long, the whorls definite or indefinite; flowers 5 to 9 lines long; pedicels 1¼ to 4 lines long; upper calyx-lip entire or obscurely notched, the lower entire or minutely toothed; petals blue, bluish, pink or rarely yellowish; banner glabrous, its yellowish center fading at length to a sordid blue; keel from sparsely to densely ciliate; pods 1¾ to 2¼ inches long, lanate, 6 to 8-seeded.

Valleys and alluvial bottoms of foothill cañons back of the immediate coast line, 50 to 4400 feet: Ventura and San Bernardino Cos. to San Diego Co. Dec.-July.

Locs.—Ojai Valley, *Hubby;* Santa Monica, *Crawford & Hiatt;* San Antonio Mts., *Johnston* 1444; Playa del Rey, *Abrams* 2505; Pauma Creek, w. of Palomar, *Jepson* 8484; Bonsall, San Diego Co., *Munz & Harwood* 3885; Mesa Grande, San Diego Co., *E. Ferguson* 9. This species, therefore, occupies a belt just back of the coast line. Further inland it is replaced by L. albifrons var. hallii.

Refs.—LUPINUS LONGIFOLIUS Abrams, Fl. Los Ang. 209 (1904); Jepson, Man. 531 (1925). *L. chamissonis* var. *longifolius* Wats. Bot. Cal. 117 (1876), type loc. San Diego, *Cleveland. L. mollissifolius* Dav. Bull. S. Cal. Acad. 17:57 (1918), type loc. Sierra Madre, Los Angeles Co., *Payne* 3310, may belong here.

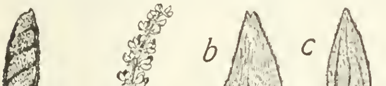

Fig. 179. LUPINUS LONGIFOLIUS Abrams. *a*, habit, × ⅙; *b*, upper lip of calyx, × 1½; *c*, lower lip of calyx, × 1½; *d*, banner, × 1; *e*, wing, × 1; *f*, keel, × 1; *g*, pod, × ½.

4. **L. chamissonis** Esch. DUNE LUPINE. Bush 1 to 3 feet high; herbage pubescent, the leaves appressed-silky; leaflets 6 to 9, oblanceolate to oblong-oblanceolate, 5 to 12 lines long; petioles short, mostly not as long as the leaflets; racemes loose, 4 to 6 inches long, the whorls distinct or indistinct; flowers 5½ to 6½ lines long; pedicels 2 to 3 lines long; upper calyx-lip cleft, the lower entire; petals blue or lavender; banner pubescent on the back near the apex, the yellow spot not changing; keel non-ciliate or nearly so; pods 1 to 1¼ inches long, 4 to 7-seeded.

Coastal sand hills: San Francisco to Los Angeles Co. May-June.

Locs.—San Francisco, *Tidestrom;* Merced Lake, *Jepson* 2635; Monterey; Arroyo Grande, *Alice King;* Santa Monica, *Hasse;* Redondo (Erythea 6:71).

Refs.—Lupinus chamissonis Esch. Mem. Acad. Petersb. 10:288 (1826), type loc., undoubtedly, San Francisco sand dunes, *Chamisso;* Jepson, Fl. W. Mid. Cal. 315 (1901), ed. 2, 217 (1911), Man. 531 (1925). Var. *longebracteatus* Wats.; B. & W. Bot. Cal. 1:117 (1876), type loc. San Francisco, *Bigelow, Greene.*

5. **L. arboreus** Sims. Tree Lupine. Shrub 4 to 8 feet high, or often lower and merely suffrutescent; herbage pubescent or puberulent or silky; leaflets 5 to 11, oblanceolate, ¾ to 2½ inches long; petioles 5 to 12 lines long; racemes 4 to 12 inches long, commonly loose, with very indistinct verticils; pedicels 4 to 5 lines long; flowers 6½ to 8 lines long; upper calyx-lip slightly cleft, the lower entire; petals sulphur-yellow or sometimes white or blue; banner orbicular, aging purple, or the whole corolla aging pinkish or purple; keel falcate, ciliate except on acumen; pods 1½ to 2¾ inches long, 8 to 12-seeded; seeds oblong, dark, a pair of pale spots enclosing the micropyle.

Sand dunes and sandy slopes, 5 to 300 feet: near the ocean from Del Norte Co. to Santa Barbara Co. Apr.-June.

Locs.—Crescent City, *Howell;* Duncans Mills, Russian River, *K. Brandegee;* Markham, Russian River, *Jepson* 15,952; Inverness, *Jepson* 8296; Presidio, San Francisco, *Jepson* 39t; Merced Lake, *Jepson* 2636, 2637; Glen Echo, Santa Cruz Co., *Jepson* 28t; Corallitos, *Jepson* 27t; Pajaro hills, *Chandler* 396; Carmel Bay, *Heller* 6804; Oso Flaco sand hills, sw. San Luis Obispo Co., *Summers;* Santa Barbara, *Dunn.* Rarely back of the coast line: Antioch, *H. A. Walker* 2511.

Refs.—Lupinus arboreus Sims, Bot. Mag. t. 682 (1803), type cult. at Kensington, Eng., "its native country is not known to us", but abundantly cultivated in England at a very early date from California seed (Bot. Reg. sub t. 32,—1838), which, doubtless, was collected by Menzies; Jepson, Fl. W. Mid. Cal. 314 (1901), ed. 2, 216 (1911), Man. 531 (1925). *L. propinquus* Greene, Erythea 1:126 (1893), type loc. Santa Barbara, the first station cited. *L. eximius* Davy, Erythea 3:116 (1895), type loc. ridge above Lake Pilarcitos, San Mateo Co., *Davy* 1050. *L. arboreus* var. *eximius* C. P. Sm.; Jepson, Man. l.c. L. rivularis Dougl.; Lindl. Bot. Reg. t. 1595 (1833), type from Cal., *Douglas,* may be the same as L. arboreus.

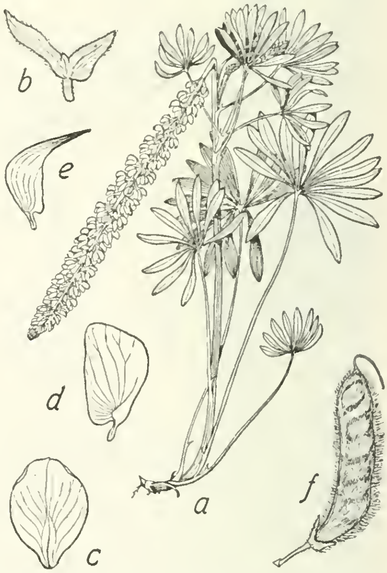

Fig. 180. Lupinus polyphyllus Lindl. *a*, habit, × ⅑; *b*, calyx, × 1½; *c*, banner, × 1; *d*, wing, × 1; *e*, keel, × 1; *f*, pod, × ⅔.

6. **L. polyphyllus** Lindl. Blue Pod. (Fig. 180.) Stems erect, stout, often hollow, nearly simple, leafy, 2½ to 5 feet high; stems and petioles glabrous or more or less villous; petioles 6 to 13 inches long except the uppermost; leaflets 9 to 17, oblanceolate or lanceolate, glabrous above, sparingly hirsute beneath, 3 to 6 inches long; racemes short-peduncled, dense, 1 to 2 feet long; flowers not in whorls or indefinitely whorled, 6 to 7 lines long, on pedicels 2½ to 4 lines long; calyx-lips entire or somewhat toothed; corolla with blue wings and red-purple banner; keel falcate, acuminate, glabrous; pods 1 to 1½ inches long, ¼ inch broad, 7 to 9-seeded.

Moist flats or swales, 20 to 4800 feet: Coast Ranges from San Mateo Co. to Siskiyou Co.; Sierra Nevada from Nevada Co. to Lassen Co. North to British Columbia. June-July.

Locs.—Coast Ranges: San Pedro, San Mateo Co., *Elmer* 4444; Sausalito, *Greene;* Howell Mt., *Jepson* 24t, 44t; Fort Bragg, *Bolander* 6507; Fields Ldg., Humboldt Bay, *Tracy* 2495; Arcata, *K. J. Stirring;* Rush Creek, Trinity Co., *H. S. Yates* 434; Sisson, Mt. Shasta, *Jepson* 47t, 16t. Callahan, Siskiyou Co., *Alexander & Kellogg;* Oro Fino, Siskiyou Co., *Butler* 376. Sierra Nevada: Bear Valley, Nevada Co., *Jepson* 33t, 41t; Quincy, *Jepson* 4149; Morgan, Tehama Co.; North Fork Battle Creek, se. Shasta Co., *Hall & Babcock* 4279; Big Valley, Lassen Co., *M. S. Baker*.

Refs.—Lupinus polyphyllus Lindl. Bot. Reg. t. 1096 (1827), type loc. nw. N. Am., *Douglas;* Jepson, Fl. W. Mid. Cal. 316 (1901), ed. 2, 218 (1911), Man. 528 (1925). *L. grandifolius* Lindl.; Agardh, Syn. Gen. Lup. 18 (1835), type from Cal., *Douglas. L. polyphyllus* var. *grandifolius* C. P. Sm.; Jepson, Man. 528 (1925). In the form var. grandifolius of the coastal region (Santa Cruz Co. to Humboldt Co.) the stems and petioles are more or less villous, but the racemes are not always "compact", nor are the pedicels always "stouter", nor the leaves always large. *L. magnus* Greene, Pitt. 3:160 (1897), type loc. San Francisco Bay region, *Greene*.

7. **L. superbus** Hel. Meadow Lupine. Similar to L. polyphyllus; leaflets 5 to 10, 1¼ to 3¼ inches long; racemes slender, loose or sometimes dense, 3 to 10 inches long; flowers 6 lines long; ovules 7 or 8.

Meadows and stream banks, 4000 to 8500 feet: San Bernardino Mts.; Sierra Nevada from Tulare Co. to Lassen Co. May-July.

Variation.—In the case of a new form such as L. superbus Hel., the first specimen collected may not exhibit the usual range of variation in that form. There is, in fact, every gradation from the somewhat densely flowered racemes of the original specimens of L. superbus Hel. to extremely loose states described as L. elongatus Greene. L. superbus is a more exiguous, less robust state of L. polyphyllus Lindl. and were, perhaps, better made a variety of it. It has long passed as a state of that species. There is no constant difference in density of racemes, size of flowers, or size and number of leaflets between L. superbus and L. polyphyllus.

Locs.—San Bernardino Mts.: South Fork Mdws., Santa Ana River, *Hall* 7677; Mare Flats, *B. L. Crawford.* Sierra Nevada: Giant Forest, *K. Brandegee* (leaflets 8, 4 to 5¾ inches long; racemes lax; flowers 6 lines long); Bishop Creek, Inyo Co., *Shockley* 431; Bear Creek, Fresno Co., *Hall & Chandler* 400 (leaflets 10 or 11); Hogan Mt., Mariposa Co., *Congdon;* Tuolumne Mdws., *Munz* 7552; Frenchman Mdw., Dorrington, Calaveras Co., *Jepson* 10,186; Kirkwood, Amador Co., *E. Mulliken* 129; Truckee, *Sonne;* Donner Lake, *Heller* 6911; Jonesville, Butte Co., *Copeland* 422; Janesville, Lassen Co., *T. Brandegee.*

Refs.—Lupinus superbus Hel. Muhl. 2:209 (1906), type loc. near Bishop, Inyo Co., *Heller* 8349; Jepson, Man. 528 (1925). *L. burkei* Wats. Proc. Am. Acad. 8:525 (1873), type loc. Carson City, Nev., *Anderson* 46, in part. *L. elongatus* Greene; Hel. Muhl. 6:17 (1910), type loc. Spooner, Douglas Co., Nev., *Baker* 1135. *L. superbus* var. *elongatus* C. P. Sm.; Jepson, Man. 528, fig. 521 (1925). *L. superbus* var. *bernardinus* Abrams; C. P. Sm. in Jepson, Man. l.c., type loc. Deep Creek, San Bernardino Mts., *Abrams & McGregor* 733.

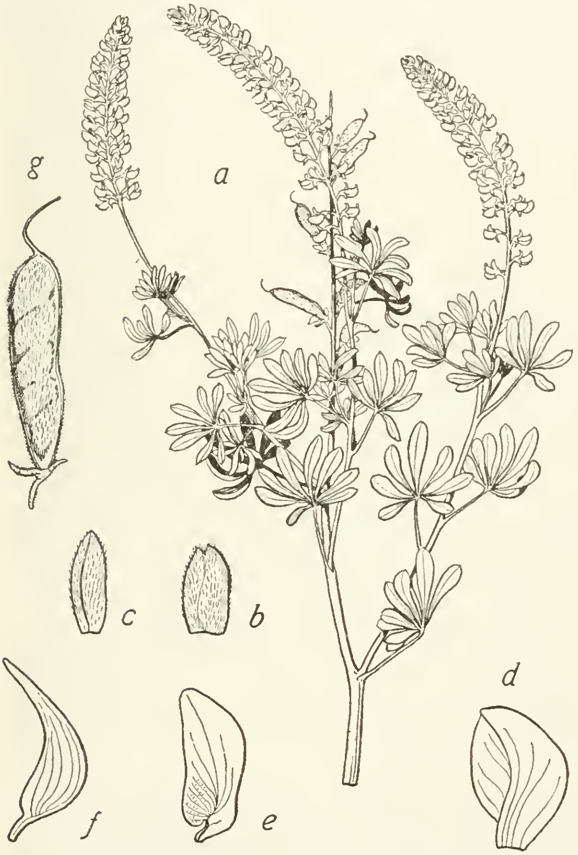

Fig. 181. Lupinus albicaulis Dougl. *a*, flowering branch, × ¼; *b*, upper lip of calyx, × 1½; *c*, lower lip of calyx, × 1½; *d*, banner, × 2; *e*, wing, × 2; *f*, keel, × 2; *g*, pod, × 1.

8. **L. albicaulis** Dougl. Pine Lupine. (Fig. 181.) Stems usually erect, usually slender, several from a heavy root-crown, often branched above the middle,

1½ to 3 feet high; herbage strigulose; leaflets 5 to 9, oblong-oblanceolate, obtuse and mucronate, 1 to 2 inches long; petioles ¾ to 2 inches long; stipules linear or subulate; racemes mostly short-peduncled, lax, 1½ to 7 inches long, more or less whorled, or the whorls indefinite; flowers 4 to 6 (or 8) lines long; pedicels spreading-pubescent, 2 to 3 lines long; calyx with long nearly equal lips; upper lip toothed, the lower entire; petals all narrow, dull white to blue, violet, lilac or purplish, fading brown or sordid; banner ovate-acute, glabrous; keel slender, elongated falcate, much exposed, glabrous; pods silky-villous, 1 to 2 inches long, 4 to 5 lines wide; ovules 5 to 7.

Dry hill slopes and plateaus, in open pine woods and in valleys, 2000 to 8500 feet: Sierra Nevada from Tulare Co. to Shasta Co.; Coast Ranges from Trinity Co. to Siskiyou Co. North to Washington. June-Aug.

Locs.—Lupinus albicaulis Dougl., typically of the Columbia River region, is subject to not a little perplexing variation as it ranges southward into California under varying conditions of mountain, plateau, high and low meadows and valleys. Many of these variants have been named as species, but since they are merely variable forms we cite specimens in connection with the named segregates. The following spms. are fairly typical of L. albicaulis Dougl. in its northern phase, the plants sparsely pubescent and the banner narrow and acute as originally described: Fall River Sprs., ne. Shasta Co., *Hall & Babcock* 4204; Battle Creek Mdws., ne. Tehama Co., *J. Grinnell;* Nevada City, *Sonne;* Hockett Mdws., Tulare Co., *Hall & Babcock* 5613. Smaller-flowered spms. represent the form called *L. shastensis* Hel.: Shasta Sprs., Siskiyou Co., *Heller* 8024. The var. HYACINTHINUS Jepson comb. n. (*L. formosus* var. *hyacinthinus* C. P. Sm.), with a large roundish banner, is a form common in the southern Sierra Nevada and Southern California mountains: Yosemite Valley, *Abrams* 4462; Mt. San Jacinto, *C. V. Meyer* 175; Bear Valley, San Bernardino Mts., *Parish* 3778; Tamarack Valley, San Jacinto Mts., *Hall* 2498. A similar usually more pubescent mutation of the Sierra Nevada from Fresno Co. to Tulare Co., with conspicuous foliaceous stipules, represents var. FULCRATUS Jepson comb. n. (*L. fulcratus* Greene): Kaiser Peak, Fresno Co., *Wieslander.* Many smaller-flowered Sierra Nevada and Southern California montane plants with rounded banner and shorter usually less exposed keel represent *L. andersonii* Wats.: Greenhorn Mt., Siskiyou Co., *Butler* 1349; Poso Creek Mdws., e. Tehama Co., *J. Grinnell;* Martin Sprs., Eagle Lake, *Brown & Wieslander* 61; Bridal Veil Falls, Yosemite, *Hall* 8856; Bluff Lake, San Bernardino Mts., *Munz* 10,524. In the North Coast Ranges several local races may be distinguished. *L. sylvestris* Drew is a yellow-flowered phase with the banner roundish and the keel sometimes broader and less exposed: Coffee Creek, Salmon Mts., Trinity Co., *Hall* 8558; Dorleska, Salmon Mts., *Hall* 8610. A large proportion of spms. throughout the range of the group are more pubescent than the usual northern phase of L. albicaulis Dougl. and are here referred to var. proximus Jepson (*L. proximus* Hel.). The original *L. proximus* Hel. does not differ materially from the variety proximus Jepson as characterized below. In *L. adsurgens* Drew, a smaller-flowered race of Humboldt Co., specimens from the type locality and occasionally elsewhere have a very narrow aperture between the reflexed banner and the upper margins of the wings: Dinsmore ranch, Van Duzen River valley, *Tracy* 4200; South Fork Mt., *Chesnut & Drew* (type collection); Kneeland Prairie, *Tracy* 7495; Wilder Ridge, *Tracy* 6298. The following spm. represents the form called *L. formosus* var. *clemensae* C. P. Sm.: Nelson Creek, Plumas Co., *Hall* 9310. In the Southern California mountains var. proximus passes into var. elatus Jepson, and at lower elevations or in the foothills lying next the valley floors, especially in the Sierra Nevada foothills, intergrades with L. formosus Greene.

Var. **proximus** Jepson comb. n. Pubescence dense, sub-silky; flowers 4½ to 8 lines long, pale to deep purple (or pale yellow); banner narrowly ovate to roundish; keel often broader with the acumen shorter in proportion and less exposed.—Open slopes or ridges, 2000 to 7400 feet: Humboldt Co. to Siskiyou Co.; Sierra Nevada from Plumas Co. to Kern Co.; Southern California in Ventura and San Bernardino Cos. May-June.

Locs.—Shasta Valley, Siskiyou Co., *Butler* 709; Upton, near Sisson, *Jepson* 8t; Mt. Elwell, Plumas Co., *Hall* 9313; Nevada City, *Heller* 8101; Tahoe, Lake Tahoe, *Jepson* 7723 (somewhat less pubescent, intermediate toward L. shastensis Hel. and L. andersonii Wats.); New York Ravine, Eldorado Co., *K. Brandegee;* Placer Co., *M. M. Hardy;* Harmon Peak, Calaveras Co., *Davy* 1418; Jackson (e. of), *Hansen* 746; Wawona, Mariposa Co., *Hall* 9006, 8999; Long Mdw. to Mt. Silliman, *Jepson* 719; Colony Mill, Tulare Co., *Jepson* 635; Keene, Kern Co., *Heller* 7814 (type number *L. proximus* Hel.); Mt. Pinos, Ventura Co., *Hall* 6509; Baldwin Lake, Bear Valley, San Bernardino Mts., *Chandler* 4.

Var. **elatus** Jepson comb n. Pubescence densely silvery-silky; flowers 5 to 7 lines long; banner suborbicular, sometimes pubescent dorsally.—Dry coniferous slopes or cañons, 6300 to 8400 feet: Southern California mountains from northern Ventura Co. to the San Bernardino Mts.

Locs.—Seymour Creek, Mt. Pinos, Ventura Co., *Munz* 7007; Swartout Valley, San Antonio Mts., *Johnston* 4568; Waterman Ridge, San Gabriel Mts., *Peirson* 2438; San Gabriel Peak, *Peirson* 88, 89; Warrens Well, e. base San Bernardino Mts., *Jepson* 12,637.

Refs.—LUPINUS ALBICAULIS Dougl.; Hook. Fl. Bor. Am. 1:165 (1834), type loc. Fort Vancouver on the Columbia, *Douglas;* Jepson, Man. 528 (1925). *L. falcifer* Nutt.; T. & G. Fl. 1:378 (1840), type loc. "Oregon about Ft. Vancouver", *Nuttall,* as synonym. *L. shastensis* Hel. Muhl. 2:67 (1905), type loc. Sacramento River, above Shasta Sprs., Siskiyou Co., *Heller* 8024. *L. albicaulis* var. *shastensis* C. P. Sm.; Jepson, Man. 528 (1925). Var. HYACINTHINUS Jepson. *L. hyacinthinus* Greene, Lflts. 2:85 (1910), type loc. San Jacinto Mts., *Hall* 712; Jepson, l.c. 529. *L. formosus* var. *hyacinthinus* C. P. Sm.; Jepson, Man. 529 (1925). *L. andersonii* Wats. Bot. King 58 (1871), type loc. Carson City, Nev., *Anderson* 9; Jepson, Man. 528 (1925). *L. andersonii* var. *apertus* C. P. Sm.; Jepson, Man. l.c. *L. apertus* Hel. Muhl. 8:103 (1912), type loc. Summit sta., Placer Co., *Heller* 6978 (stems simple; flowers 6 lines long). Var. FULCRATUS Jepson. *L. andersonii* var. *fulcratus* C. P. Sm.; Jepson, Man. l.c. *L. fulcratus* Greene, Pitt. 3:159 (1897), type loc. "Fresno Co." (that is, near Peckinpah Mill, now Madera Co.), *L. A. R. Peckinpah* (stipules herbaceous, oblanceolate or lanceolate). *L. fraxinetorum* Greene, Lflts. 2:234 (1912), type loc. "Sequoia Forest Res., Fresno Co." (probably Tulare Co.), *R. Hopping* (stipules herbaceous, free, oval or oblong). *L. sylvestris* Drew, Bull. Torr. Club 16:150 (1889), type loc. e. side of South Fork Mt., Humboldt Co., *Chesnut & Drew;* Jepson, l.c.; not L. silvestris Lam. (1778). *L. albicaulis* var. *sylvestris* Greene, Fl. Fr. 42 (1891). *L. elmeri* Greene, Pitt. 3:159 (1897). Var. PROXIMUS Jepson. *L. proximus* Hel. Muhl. 2:67 (1905), type loc. Girard sta., Kern Co., *Heller* 7814. *L. adsurgens* Drew, l.c., type loc. w. side South Fork Mt., Humboldt Co., *Chesnut & Drew;* Jepson, l.c. *L. gormanii* Piper, Smithsonian Misc. Coll. 50:200 (1907), type loc. middle peak of Three Sisters, Ore., *M. W. Gorman.* *L. formosus* var. *clemensae* C. P. Sm.; Jepson, Man. 529 (1925), type loc. Greenville, Plumas Co., *M. S. Clemens* (banner often pubescent dorsally). *L. adsurgens* var. *undulatus* C. P. Sm.; Jepson, l.c., type loc. "Yosemite to Tuolumne Grove," *Eastwood* 13. Var. ELATUS Jepson. *L. elatus* Jtn. Bull. S. Cal. Acad. 17:63 (1918), type loc. Icehouse Cañon, San Antonio Mts., *Johnston* 1627. *L. formosus* var. *elatus* C. P. Sm.; Jepson, l.c.

9. **L. formosus** Greene. LUNARA LUPINE. Stems several from the root-crown, decumbent or ascending, sometimes erect, 2 to 3 feet long, the whole plant silky-pubescent; leaflets mostly 7 to 9, narrowly or broadly oblanceolate, acute or acuminate, ¾ to 1½ (or 2) inches long, the petioles ¾ to 2 (or 3½) inches long; racemes 3 to 9 inches long, somewhat dense, sometimes lax, the peduncles short or scarcely any; pedicels slender, 1½ to 3½ lines long; flowers in more or less distinct whorls, 5½ to 7½ lines long; calyx-lips subequal, long and narrow, the lower entire or nearly so, at length somewhat reflexed, the upper very shortly cleft; petals purplish-blue, lilac-purple, violet, pale yellow or white; banner suborbicular to oblong or rarely narrowly ovate, glabrous, its white or yellow spot turning sordid; wings broad, equaling and usually enfolding the glabrous keel; acumen of the narrowly falcate keel elongated in age, sometimes a little, often much exposed; ovules 5 to 7; pods silky-pubescent, 1¼ to 1¾ inches long, 3 to 5 lines wide.

Rich soil of high places in fields and sandy lands of valleys and on dry hillsides, 50 to 2500 feet: Great Valley plains and bordering foothills; Coast Range valleys; south to coastal Southern California. Apr.-Oct.

Locs.—Coast Ranges: Bucksport, Humboldt Co., *Tracy* 2113; Ukiah, *Jepson* 2507; Hopland Valley, *Jepson* 9288, *C. F. Baker* 3005 (banner narrow, acute); Berryessa Valley, ne. Napa Co., *Jepson;* Howell Mt., *Jepson* 48t, 69t; Napa Valley, *Brewer* 857 (cited by Greene); Benicia, *Chandler* 6099; Novato, Marin Co., *Jepson* 9055; Olema, Marin Co., *Jepson* 8289; Mill Valley, Marin Co., *Kennedy* 4702; Berkeley Hills, *Jepson* 2t, 15,179; San Leandro, *Davy;* Livermore, *Jepson* 18t; Los Gatos foothills, *Heller* 7383; San Luis Obispo, *Brewer* 469. Great Valley: Stillwater, Shasta Co., *Baker & Nutting;* Red Bluff, *Jepson* 4t, 36t; Vacaville, *Jepson;* Denverton, Solano Co., *Jepson* 43t; betw. San Joaquin River bridge and Burnet sta., *Jepson* 55t; Delhi, Merced Co., *Jepson* 12,748. S. Cal.: Santa Barbara, *Brewer* 284; Ojai Valley, *Hubby;* Claremont, *E. D. Palmer;* San Bernardino, *Jepson* 5530; Beaumont, *R. J. Smith.*

Var. **robustus** C. P. Sm. Stems stouter; herbage densely silky and also long-villous; racemes dense, 1½ to 1¾ inches wide; flowers 8 to 9 lines long.—Valley fields, Colusa Co. to Merced Co. Apr.-June.

Locs.—College City, Colusa Co., *Alice King;* Livermore, Alameda Co., *Jepson;* Burnet, San Joaquin Co., *Jepson* 56t; Modesto, *K. Brandegee.*

Refs.—Lupinus formosus Greene, Fl. Fr. 42 (1891), type loc. Mare Isl., *Greene;* Jepson, Fl. W. Mid. Cal. 316 (1901), ed. 2, 218 (1911), Man. 529 (1925). *L. pendletonii* Hel. Muhl. 2:295 (1907), type loc. Mt. Hamilton, Santa Clara Co., *Heller* 8610. *L. purpurascens* Hel. Muhl. 2:66 (1905), type loc. Redding, Shasta Co., *Heller* 7847. *L. formosus* var. *bridgesii* Greene, l.c.; Jepson, Man. l.c. *L. albicaulis* var. *bridgesii* Wats. Proc. Am. Acad. 8:527 (1873), type loc. near San Francisco ("the more villous form, with largest flowers and densest racemes"). *L. bridgesii* Hel. Muhl. 1:112 (1905). *L. greenei* Hel. Muhl. 6:72 (1910). *L. adsurgens* var. *lilacinus* Hel.; C. P. Sm. in Jepson, Man. l.c., type loc. Glenn Co., *Heller* 11,945 (aperture between banner and upper wing margins narrow). Var. robustus C. P. Sm.; Jepson, Man. l.c., type loc. College City, Colusa Co., *Heller & Brown* 5573.

10. **L. littoralis** Dougl. Chinook Liquorice. Stems slender, decumbent or ascending, 1 to 3 feet long; root yellow, somewhat fleshy; stems hirsute with ascending hairs, the hairs sometimes dense and rather shaggy, especially below; leaflets appressed-hirsute, sometimes subglabrous above; leaflets 5 to 7, oblanceolate or cuneate-oblong, acute, ½ to 1 inch long, at least half as long as the petioles, strigose on both sides and often somewhat silky; petioles mostly short, ½ to 1½ inches long; racemes (2 or) 3 to 8 inches long, the whorls discrete or sometimes the flowers more or less scattered; flowers 5½ to 7 lines long; calyx-lips of nearly equal length, lower entire, upper slightly cleft; petals blue or lilac, the banner shorter than the wings; keel ciliate; pods hirsute, ¾ to 1¾ inches long; seeds elliptic, brown, with black spots.

Sea-beaches or dunes or bluffs along the coast line: Mendocino Co. to Humboldt Co. North to British Columbia. May-July.

Locs.—Fort Bragg, *J. T. Howell* 4256; Elk River (mouth), Humboldt Co., *Tracy* 3745; Humboldt Bay, *Tracy* 3556; Bucksport, *Tracy* 4785. A common plant on the Washington and Oregon coasts, becoming less common as it extends southward. In Mendocino Co. it meets L. variicolor Steud., by which it is replaced southward and to which it is closely related.

Refs.—Lupinus littoralis Dougl.; Lindl. Bot. Reg. t. 1198 (1828), type loc. "seashore, from Cape Mendocino to Puget Sound," *Douglas;* Jepson, Fl. W. Mid. Cal. 316 (1901), ed. 2, 217 (1911), Man. 530 (1925).

L. abramsii C. P. Sm. Bull. Torr. Club 51:308 (1924), type loc. Los Pesares, Santa Lucia Mts., Monterey Co., *Abrams* 7360. Banner pubescent dorsally (ex char.); said to belong to the L. littoralis group.

11. **L. tidestromii** Greene. Clover Lupine. Stems slender, decumbent, several from the branched root-crown, 4 to 12 inches long; herbage silvery-silky, especially the leaves; leaflets 3 to 5, oblanceolate, acute, 5 to 11 lines long; petioles 5 to 9 lines long; racemes loose, 1 to 3 inches long, the whorls 1 to 4 (or 5); flowers 5 to 6 lines long; pedicels 1 to 2 lines long; petals blue; white or yellow center of banner turning violet; keel ciliate; pods 10 to 12 lines long, 5 to 8-seeded.

Sand dunes near the coast: Pt. Pinos, Monterey Co.; Pt. Reyes, Marin Co. May-June.

Tax. note.—Lupinus tidestromii is related to L. littoralis. The pubescence of pedicels and calyces is more spreading in the former. The calyx-tube of L. tidestromii is almost ⅓ longer and broader than in L. littoralis and the upper portion of it more scarious or gibbous, while in L. littoralis it is not scarious or gibbous or only slightly so. The upper calyx-teeth in L. variicolor are broadly triangular with a wide v-shaped notch, whereas in L. littoralis the teeth are oblong-lanceolate with narrow sinus.

Refs.—Lupinus tidestromii Greene, Erythea 3:17 (1895), type loc. Pacific Grove, *Tidestrom;* Jepson, Man. 530 (1925).

12. **L. variicolor** Steud. Particolor Lupine. Stems slender, decumbent or prostrate, several from a woody base, forming a low plant commonly ½ to 1½ feet high; herbage scantily or somewhat densely hairy-pubescent or villous; leaflets 6 to 9, oblanceolate, acute, ½ to 1 inch long; petioles slender, ¾ to 1¾ inches long; racemes ¾ to 2½ inches long, the distinct whorls 1 to 4; flowers 5 to 7 lines long; pedicels 2 to 3 lines long; petals blue, purple, pink, white or yellow, the banner

commonly differently colored from or paler than the wings; keel ciliate on upper half; pods 1¼ to 2½ inches long, 6 to 10-seeded.

Grassy fields and slopes and sand dunes near the coast, 5 to 500 feet: Monterey Co. to Mendocino Co. Apr.-June.

Locs.—Carmel; Pacific Grove, *Jepson* 63t; Montara Pt., San Mateo Co., *Copeland* 3301; Mission Hills, San Francisco, *Michener & Bioletti;* Mt. Davidson, San Francisco, *Jepson* 10,333; Presidio, San Francisco, *Jepson* 62t; Pt. Reyes, *Davy* 6716; Fort Bragg, *Davy* 6151.

Refs.—LUPINUS VARIICOLOR Steud. Nom. ed. 2, 2:78 (1841); Jepson, Fl. W. Mid. Cal. 315 (1901), ed. 2, 217 (1911), Man. 530 (1925). *L. versicolor* Lindl. Bot. Reg. t. 1979 (1837), type cult. from Cal.; not L. versicolor Sweet (1831). *L. franciscanus* Greene, Pitt. 1:64 (1887), type loc. Presidio and U. S. Marine Hospital, San Francisco, *Greene. L. micheneri* Greene, Erythea 2:119 (1894), type cult. at Univ. Cal. Botanic Garden, transplanted from Fort Bragg, Mendocino Co., *Michener.*

13. **L. rivularis** Dougl. CAÑON LUPINE. NINE FINGER. Stems erect, several from the root-crown and forming a clump, branched above, usually red-brown, 2 to 5 feet high; herbage minutely appressed-pubescent or glabrate; lower leaves long-petioled, usually withered by flowering time, the middle leaves largest; leaflets commonly 7 to 9 (5 to 12), oblong-oblanceolate, mostly acute, 2 to 6 inches long; racemes 8 to 18 inches long, rather lax; flowers 5 to 7 lines long, whorled or scattered; pedicels 1 to 3 lines long; petals light blue, purple or pink, rarely yellowish, fading brown; keel somewhat exposed, arcuate (almost right-angled), ciliate on upper edges at middle, or from middle to claws; pods dark brown, densely hairy, about 1¼ inches long; ovules 7 to 10; seeds mottled with dark brown.

Open woods or thickets, hillslopes or cañons, 100 to 7200 feet: coastal region from Los Angeles Co. to Humboldt Co.; Sierra Nevada from Tulare Co. to Modoc Co. South to Lower California, north to Washington. Apr.-May.

Tax. note.—The type of Lupinus rivularis Dougl., a species published by John Lindley, is presumably preserved in the Lindley Herbarium, Cambridge University, England. Four sheets from that herbarium (which concern matters at issue) have been studied. We annotate them as follows: First is a sheet with the label "Herb. Soc. Hort. Lond. America boreali-occidentalis. Douglas 1830." This specimen is chosen as the type. Its origin is unquestionable. We may confidently believe it the plant named Lupinus rivularis by Douglas. The sheet bears an annotation by Asa Gray: "I suppose the wild of L. rivularis Lindl. (non Ag.). A G." The term "America boreali-occidentalis", northwest America, in the case of Douglas plants, means almost invariably Oregon or Washington. The indication "California" by Lindley (Bot. Reg. t. 1595), as to origin of the Douglas plant, was doubtless an error, or used in the extended and loose sense of that early day as applying to the region stretching nearly or quite to the Columbia River. Moreover, and quite conclusively, Douglas was exploring the present territory of Oregon and Washington in 1830 and did not arrive in California (Monterey) until December 22 of that year. His specimen is a flowering one.

Specimens from Montesano, Wash. (*Heller* 3906), match the type sheet rather closely. In pubescence and shape and size of leaflets the following Californian plants come rather close: Alton, Humboldt Co., *Tracy* 6376; St. Helena, *Jepson* 26t; Crystal Springs Lake, San Mateo Co., *C. F. Baker* 470.

The general appearance of the specimen in the Lindley Herbarium, here taken as the type, is strikingly like the illustration accompanying the original diagnosis (Bot. Reg. t. 1595). The resemblance holds as to foliage, inflorescence and flowers. The leaflets are 5 or 6 to 8, exactly oblanceolate, 1 to 1⅞ inches long, shortly apiculate, glabrous above, strigulose below, the margins usually hairy. The stems have a thin pubescence of fine short ascending hairs. The pedicels and calyx are more densely pubescent than the stem. The lower calyx-lip is narrow and long, and strongly keeled as far as the entire apex; the upper lip is narrow, keeled and notched at apex.

Second is a sheet which has no label and appears to be, without reasonable doubt, a duplicate of the sheet first mentioned.

Third is a sheet with the label "California. Douglas", the label being the light blue label or ticket so commonly used by Douglas. The sheet bears also a label with the note "Lupinus rivularis B R. 1595" apparently in the hand of J. G. Agardh. There is also an annotation by Asa Gray in his scarcely decipherable hand: "not Lupinus rivularis B R 1595. Agardh is wrong, but = L. arboreus!! A. G." Asa Gray's determination is quite correct. The sheet also bears a specimen of Lupinus arboreus collected by Coulter, in California, the label carrying the name Lupinus rivularis Lindl. These specimens may well have been collected at Monterey, possibly at the time when Douglas and Coulter botanized together near the old Spanish capitol.

Fourth is a sheet bearing a garden specimen (a single flowering branchlet which is leafy below), propagated in London from California seed collected by Douglas. It bears ("in the handwriting of Agardh", says Lindley,—Bot. Reg. sub t. 1979) the label: "Lupinus rivularis prox. Nro 1. D. C. 1833. California. Douglas. Garden specimen". Below this label is another label: "L. versicolor B. Reg. *1979*". This sheet, then, is the type of Lupinus versicolor Lindl. (1837), which name, a later homonym, is now replaced by the name Lupinus variicolor Steud. (1841). On the sheet are three other specimens collected in California by Coulter and bearing Coulter's number 393. These are likewise Lupinus variicolor Steud.

Locs.—S. Cal.: San Diego, *M. F. Spencer* 97; Dark Cañon, Mt. San Jacinto, *Jepson* 2276; San Antonio Cañon, San Gabriel Mts., *Peirson* 464; Lukens Peak, San Gabriel Mts., *Peirson* 2147; Rattlesnake Cañon, Santa Barbara, *Jepson* 9121. Coast Ranges: Estrella, San Luis Obispo Co., *Jared;* San Mateo Creek, San Mateo Co., *Davy* 1085; Berkeley, *Jepson* 25t; Vaca Mts., *Jepson* 52t; St. Helena, *Jepson* 26t; South Yollo Bolly, *Jepson* 58t; Dyers Ranch to Hawkins Bar, New River, *Jepson* 1991; Hayfork Mt., Trinity Co., *Tracy* 6438. Sierra Nevada: Colony Mill to Marble Fork, Tulare Co., *Jepson* 649; McKinley Big Trees, Fresno Co., *Jepson* 16,013; Huntington Lake, *Jepson* 13,104 (Line Creek), 12,995 (Billie Creek); Nellie Lake, Fresno Co., *A. L. Grant* 1084; North Fork, Madera Co., *R. Noddin;* Fresno Big Trees, *Jepson* 15,976; Lake Merced, Merced River, *Jepson* 3193; Merced Big Trees, *Jepson* 65t; betw. Bower Cave and Hazel Green, Mariposa Co., *Jepson* 8380; Hetch-Hetchy, *A. L. Grant* 864; Jupiter, Tuolumne Co., *A. L. Grant* 775; Avery sta., Calaveras Co., *A. L. Grant;* Salmon Falls, Eldorado Co., *Jepson* 15,759; Cascade Lake, Tallac, *C. J. Fox Jr.;* Warner Mts., *Manning;* Olinda, Shasta Co., *Blankinship.*

Variations.—Var. dudleyi C. P. Sm. (sub L. latifolius Agardh), a villous form, with stems decumbent at base.—Montara Mts., San Mateo Co. Var. parishii C. P. Sm. (sub L. latifolius Agardh), a stout tall form, typically of the San Bernardino and San Gabriel mountains and foothills. Var. columbianus C. P. Sm. (sub L. latifolius Agardh), wings broader, covering most of the keel.—Sierra Nevada.

Var. **barbatus** Jepson comb. n. Stout; stipules long, villous with spreading hairs or hirsute with ascending ones; pedicels 1 to 2¼ lines long.—Modoc Co.: Emerson Cañon, Warner Mts., *L. S. Smith* 1047. North to southern Oregon.

Var. **viridifolius** Jepson comb. n. "Much-branched"; leaflets 1 to 1¾ inches long; racemes 1½ to 6½ inches long; pedicels ½ to 1 line long; flowers 4 to 5 lines long.—Mt. Shasta, *Jepson* 45t; Marble Mt., w. Siskiyou Co., *Chandler* 1623.

Refs.—LUPINUS RIVULARIS Dougl.; Lindl. Bot. Reg. t. 1595 (1833), type loc. (as per type spm. in Lindley Herbarium, Cambridge Univ.) "America boreali-occidentalis" (doubtless Oregon or Washington), *Douglas* (typ. vidi). *L. latifolius* Agardh, Syn. Gen. Lup. 18 (1835), type from Cal., *Douglas;* Lindl. Bot. Reg. t. 1891 (1836); Jepson, Fl. W. Mid. Cal. 316 (1901), ed. 2, 217 (1911), Man. 529 (1925). *L. longipes* Greene, Fl. Fr. 41 (1891), type loc. "Sierra Nevada northward to Oregon". *L. latifolius* var. *longipes* C. P. Sm.; Jepson, Man. 530 (1925). *L. latifolius* var. *dudleyi* C. P. Sm.; Jepson, l.c., type loc. Montara Mts., San Mateo Co. *L. latifolius* var. *parishii* C. P. Sm.; Jepson, l.c., type loc. near Perris Hills, w. Riverside Co., *Parish* 11,302. *L. latifolius* var. *columbianus* C. P. Sm.; Jepson, l.c. *L. confusus* Hel. Muhl. 8:63 (1912), type loc. Hood River, Wasco Co., Ore., *Heller* 10,107; not L. confusus Rose (1905). *L. columbianus* Hel. Muhl. 8:84 (1912). Var. BARBATUS Jepson. *L. barbatus* Hel. Muhl. 8:61 (1912); Jepson, Man. 529 (1925). *L. ligulatus* var. *barbatus* Henderson, Bull. Torr. Club 27:345 (1900), type loc. Glendale, s. Ore., *Henderson* 1699. Var. VIRIDIFOLIUS Jepson. *L. viridifolius* Hel. Muhl. 2:64 (1905), type loc. Dunsmuir, Siskiyou Co., *Heller* 7928; Jepson, Man. 529 (1925).

LUPINUS PIPERITUS Dav. Bull. S. Cal. Acad. 26:70 (1927), type loc. Round Mdw., *Davidson* 3645 (stem fistulous, 2 to 2¾ feet high; herbage glabrous; racemes crowded, 1¾ to 2 inches long) perhaps belongs here.

LUPINUS GRATUS Greene, Pitt. 3:160 (1897), type loc. n. slope Dixey Mts., Lassen Co., *Baker & Nutting.* Herbage cinereous-pubescent; keel short, woolly-ciliate (ex char.).

14. **L. saxosus** Howell. ROCK LUPINE. Plants 5 to 12 inches high, the erect stems several from the compact root-crown, sparsely or scarcely leafy, the leaves long-petioled and chiefly basal; herbage hirsute with spreading hairs; leaflets 8 to 12, oblanceolate, 5 to 13 lines long; petioles of basal leaves 2 to 5¾ inches long; racemes compact, 1 to 3¼ inches long, the flowers not in whorls; flowers 5 to 7 lines long; pedicels 2 to 3½ lines long; petals blue; banner with yellow center; keel ciliate on upper margin; pods villous, ¾ to 1 inch long; ovules 4 or 5.

Gravelly flats or plains and hill slopes, 3000 to 5000 feet: Modoc Co. North to eastern Washington. May-July.

Locs.—Jess Valley, Warner Mts., *E. H. Stiffen* 41; Goose Lake Valley, *R. M. Austin;* Fort Bidwell, *Manning* 52. The root-crowns develop rather large winter buds.

Refs.—LUPINUS SAXOSUS Howell, Erythea 1:110 (1893), type loc. "from near the Dalles eastward in Ore. and Wash.," *Howell;* Jepson, Man. 533 (1925).

15. **L. meionanthus** Gray. TAHOE LUPINE. Plants 7 to 16 inches high, the stems leafy, branching, several to many from a stout woody branched root-crown; herbage densely and closely silky-tomentose; leaflets 6 to 8, oblanceolate to oblong-oblanceolate, acute or mucronate, 7 to 13 lines long, the upper mostly longer than the petioles; lower petioles 1 to 1¾ inches long; racemes closely flowered or sometimes lax, narrow (6 to 7 lines wide), 1 to 5 inches long; flowers 2½ to 3 lines long; pedicels ½ to 1 line long; calyx densely tomentose, the lips about equal, the upper one slightly notched, the lower entire; petals dull blue; banner glabrous, yellow in the center; keel slightly ciliate; pod 7 to 12 lines long, 3 or 4-seeded.

Montane forests or open stony ridges, 5000 to 9400 feet: Sierra Nevada from Madera Co. to Plumas Co. Western Nevada. July-Aug.

Locs.—Minarets (range e. of), Madera Co., *Congdon;* Rancheria Mt., s. Tuolumne Co., *Jepson* 4591; Sonora Pass, *A. L. Grant* 163, 343; Castle Peak, Nevada Co., *Sonne;* Red Clover Creek, Plumas Co., *Hall & Babcock* 4449.

Refs.—LUPINUS MEIONANTHUS Gray, Proc. Am. Acad. 6:522 (1865), type loc. Carson City, Nev., *Anderson;* Jepson, Man. 526 (1925).

16. **L. ornatus** Dougl. var. **obtusilobus** C. P. Sm. GRAY LUPINE. Stems several, decumbent or ascending, arising from a branched root-crown, 6 to 10 inches high; herbage with appressed silvery-silky hairs, especially the leaflets; leaflets 5 to 7, linear to oblong but usually tapering more to base than to apex, ¾ to 2 inches long; racemes dense, 1½ to 2½ inches long, the whorls more or less indefinite; flowers 5½ to 6½ lines long; pedicels 1½ to 2½ lines long; upper calyx-lip notched, a little shorter than the lower; petals blue or lilac, the banner with yellow center, silky-pubescent on the back; keel ciliate on upper margin above the middle; pods silky, 2 inches long; ovules 4 to 5.

Gravelly summits of high peaks, 5300 to 10,000 feet: northern Sierra Nevada from Plumas Co. to Siskiyou Co. East to Nevada. July.

Locs.—Soapstone Hill, Plumas Co., *Jepson* 10,604; Jameson Lake, Plumas Co., *Hall* 9351; Brokeoff Mt., *J. Grinnell;* Lassen Peak, *Jepson* 15,329; Ash Creek, Mt. Shasta, *M. S. Baker.*

On Soapstone Hill in Plumas Co., dense colonies of seven to eleven acres occur in the opens, and extend up to the summits of the hills. On Lassen Peak this species grew at a higher altitude than any other herb (that is, at about 9500 feet), at the time of our most recent ascent in 1929.

Refs.—LUPINUS ORNATUS Dougl.; Lindl. Bot. Reg. t. 1216 (1828), type loc. Spokane River near Kettle Falls, *Douglas.* Var. OBTUSILOBUS C. P. Sm. Bull. Torr. Club 51:307 (1924). *L. obtusilobus* Hel. Muhl. 8:115 (1912), type loc. Mt. Shasta, *Geo. B. Grant* 730; Jepson, Man. 532 (1925). *L. lapidicola* Hel.; C. P. Sm. Bull. Torr. Club 51:306 (1924), type loc. Mt. Eddy, Siskiyou Co., *Heller* 13,422, apparently belongs here.

17. **L. sericatus** Kell. SATIN LUPINE. Plants 5 to 12 inches high, the proper stems short (3 to 5 inches), stoutish, decumbent, several from a woody root-crown; herbage minutely but densely silky-canescent; leaflets 6 or 7, spatulate-obovate, retuse or truncatish or sometimes obtuse, mucronate, 1 to 1¾ inches long, 7 to 11 lines wide; petioles 2 to 4½ inches long; racemes somewhat dense, 3 to 7 inches long, rather long-peduncled; flowers 5 to 5½ lines long; pedicels 1 to 2 lines long; calyx-lips large (¾ as long as the petals), the upper cleft, the lower obscurely 3-toothed; petals deep purple; banner glabrous on the back or with only a few scattered hairs at the middle; keel slender-pointed, lightly ciliolate; pods pubescent, ¾ to 1 inch long; seeds oblong, light brown and somewhat mottled.

Openly wooded mountain slopes, 2000 to 4000 feet: Napa and Mayacamas ranges. Apr.-May.

Locs.—Howell Mt., *Jepson;* Tollhouse, Mt. St. Helena, *Jepson* 14,527; betw. Middletown and Whispering Pines, *M. S. Baker;* Cobb Mt., *K. Brandegee.*

Refs.—LUPINUS SERICATUS Kell. Proc. Cal. Acad. 7:92 (1877), type loc. Lake Co., *Johanna Anderson;* Jepson, Fl. W. Mid. Cal. 316 (1901), ed. 2, 217 (1911), Man. 532 (1925).

18. **L. cervinus** Kell. DEER LUPINE. (Fig. 182.) Plants 5 to 12 inches high, the long-petioled leaves and long-peduncled racemes basal or sub-basal, arising from the very short or shortly branched stem (1 to 3 inches); herbage finely and very densely short-silky; leaflets 5 to 7, cuneate-obovate, obtuse or sometimes subacute, mucronate, 1 to 3¼ inches long, 5 to 13 lines wide; petioles 3 to 8 inches long; racemes 3 to 7 inches long, with definite or somewhat indefinite whorls, the long peduncle exceeding or not at all exceeding the leaves; flowers 6 to 7 lines long; pedicels 1½ to 2½ lines long; calyx-lips nearly equal, the upper 2-toothed, the lower 3-toothed; petals light blue; banner glabrous or pubescent on the back; keel ciliate; pods silky-pubescent with appressed hairs, 1 to 1⅛ inches long, 4 to 7-seeded.

Dry soil under pines, 1000 to 3000 feet: Santa Lucia Mts. June.

Locs.—Burro trail (both sides of summit), *K. Brandegee;* upper San Antonio River, *Jepson* 1652; Lucia, *Jepson;* Big Sur River, *Davy* 7433.

Refs.—LUPINUS CERVINUS Kell. Proc. Cal. Acad. 2:229, fig. 73 (1863), type loc. Santa Lucia Mts., *Lobb* 119; Jepson, Man. 532 (1925). *L. latissimus* Greene, Lflts. 2:68 (1910), type loc. Tassajara Hot Sprs., Monterey Co., *Elmer.*

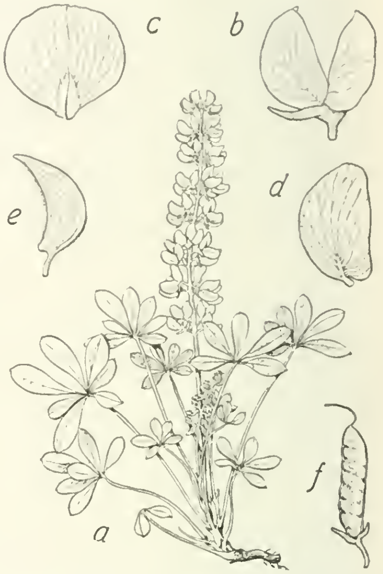

Fig. 182. LUPINUS CERVINUS Kell. *a*, habit, × ⅙; *b*, fl., × 1; *c*, banner, × 1; *d*, wing, × 1; *e*, keel, × 1; *f*, pod, × ½.

19. **L. grayi** Wats. SIERRA LUPINE. (Fig. 183.) Plants 5 to 14 inches high, the stems ascending or decumbent, several from a woody branched root-crown, the proper stems short; herbage densely and finely tomentose, usually with some villous hairs intermixed; leaves chiefly basal or sub-basal; leaflets 5 to 11, cuneate-oblong or oblanceolate, obtuse or acute, ½ to 1 (or 1½) inches long; petioles 1¾ to 5 inches long; racemes 3 to 6½ inches long, the flowers subverticillate, the whorls discrete or sometimes remote; peduncles 2 to 4½ inches long; pedicels 1 to 2 lines long; flowers 6 to 8 lines long; lower calyx-lip slender, entire or 3-cleft at apex, upper lip broad, entire or cleft; petals blue, purple, lavender or whitish, the yellow spot on the banner becoming red in age; banner glabrous on back or slightly hairy at apex, broad, its yellowish-white spot aging to purple; keel ciliate; pods ¾ to 1⅛ inches long, 4 to 6-seeded.

Stony slopes, 2400 to 6400 feet: Sierra Nevada from Kern Co. to Plumas Co. June-July.

Habit note.—Lupinus grayi is generally an inhabitant of the open hillside forests of the Pinus ponderosa belt. It is somewhat caespitose in habit or half-matted, on account of its mainly basal leaves and short proper stems which are often decumbent at base.

Locs.—Piute Peak, Kern Co., *Purpus* 5310; Colony Mill, Marble Fork Kaweah River, *Jepson* 650; Simpson Mdw., Middle Fork Kings River, *Henrietta Eliot;* Arnold Mdw., Madera Co., *A. L. Grant* 1348; North Fork, Madera Co., *Noddin;* Grouse Creek, s. Mariposa Co., *Jepson* 8383; Hazel Green, *Jepson* 11t, 64t; Yosemite, *Jepson* 10,470; Little Yosemite, *Jepson* 4398; Sugar Pine, Tuolumne Co., *Chesnut & Drew;* Strawberry sta., Tuolumne Co., *A. L. Grant* 26; Italian Bar, South Fork Stanislaus River, *Jepson* 6363; Gold Run, Placer Co., *K. Brandegee;* Blue Cañon, Placer Co., *H. A. Walker* 1281; Truckee, *Michener;* Quincy, *R. M. Austin.*

Refs.—LUPINUS GRAYI Wats. Proc. Am. Acad. 11:126 (1876); Jepson, Man. 532 (1925). *L. andersonii* var. *grayi* Wats. l.c. 8:531 (1873), type loc. near Clarks Ranch (Wawona), Mariposa Co., *Gray.*

20. **L. magnificus** Jones. Panamint Lupine. Plants 2 to 4 feet high, the proper stem rather short (3 to 11 inches) and scantily leafy, the leaves chiefly basal or sub-basal; herbage hirsute with long spreading hairs, and also tomentulose or even closely and densely tomentose; leaflets 5 to 9, very narrowly elliptical and acute at both ends, 1 to 2 inches long, 3½ to 6 lines wide; petioles 3 to 7 inches long; racemes 8 to 14 inches long, the distinct whorls mostly discrete; peduncles about 1 foot long; flowers fragrant, 8 to 8½ lines long; pedicels stout, 1 to 2 lines long; calyx-lips unequal, the upper 2-toothed, the lower obscurely emarginate; petals pink-purple, the yellow center of the banner changing to purple; banner glabrous on the back; keel shortly and sparsely ciliate on the acumen; pods 1½ to 2¼ inches long, 5 to 8-seeded.

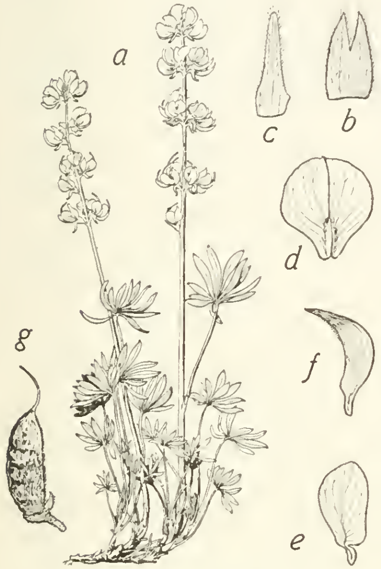

Fig. 183. Lupinus grayi Wats. *a*, habit, × ¼; *b*, upper lip of calyx, × 2; *c*, lower lip of calyx, × 2; *d*, banner, × 1; *e*, wing, × 1; *f*, keel, × 1; *g*, pod, × ⅔.

Dry gravelly cañon beds, 5500 to 7500 feet: Panamint Range. May.

Locs.—Pleasant Cañon, *Hall & Chandler* 6951; Panamint, *Hall & Chandler* 7019.

Var. **glarecola** Jones. Flowers 5 lines long; pedicels slender; petals blue.—Lone Pine, Inyo Co.

Var. **hesperius** C. P. Sm. Eight inches high; flowers 6½ to 7½ lines long; petals blue.—Bishop, Inyo Co.

Refs.—Lupinus magnificus Jones, Contrib. W. Bot. 8:26 (1898), type loc. Pleasant Cañon, Panamint Range, *Jones;* Jepson, Man. 533 (1925). Var. glarecola Jones l.c., type loc. Lone Pine, Inyo Co., *Jones;* Jepson, l.c. Var. hesperius C. P. Sm.; Jepson, l.c. *L. hesperius* Hel. Muhl. 2:212 (1906), type loc. Sierra Nevada foothills, w. of Bishop, Inyo Co., *Heller* 8359.

21. **L. onustus** Wats. Ground Lupine. Plants dwarfish, 4 to 9 inches high; stems few from the root-crown, simple or subsimple, slender, scarcely longer than the petioles, somewhat flexuose and, with the long-petioled leaves, often simulating a corymbose habit; herbage pubescent, the stems and petioles also with long intermixed hairs, these latter ascending, often slightly rusty; upper side of leaflets glabrous; leaflets 5 to 8, broadly oblanceolate, 1 to 2¼ inches long; petioles 2 to 3½ inches long; racemes 1 to 2½ inches long, not exceeding the leaves or only slightly so, few-flowered, the flowers scattered, 4 lines long; petals blue; banner glabrous; keel ciliate; pods hairy, 1¼ to 1½ inches long, 5 lines wide; ovules 5 or 6.

Open pine woods, 3400 to 5500 feet: Plumas and Lassen Cos., thence west to Trinity Co. May-July.

Locs.—Greenville Peak, Plumas Co., *Lemmon;* Susanville, *T. Brandegee;* Little East Weaver Creek, Trinity Co., *H. S. Yates* 339.

Habit note.—Lupinus onustus, in spite of its fairly wide range, is probably rather rare in individuals, and in any event is seldom collected. It is well-marked by its low habit and peculiar branching. The long-petioled primary leaves usually bear in their axils extremely short or dwarf branchlets which produce only a pair of long-petioled secondary leaves. The leaves tend, therefore, to appear a little fascicled.

Refs.—Lupinus onustus Wats. Proc. Am. Acad. 11:127 (1876), type loc. Indian Valley, Plumas Co., *Ames;* Jepson, Man. 527 (1925). *L. pinetorum* Jones, Contrib. W. Bot. 8:25 (1898), type loc. Susanville, Lassen Co., *Jones.*

Lupinus violaceus Hel. Muhl. 2:65 (1905), type loc. Sisson, *Heller* 8037. Stems simple, decumbent, about 12 inches long, forming mats; herbage short-silky, the pubescence appressed, rather sparse; leaves cauline; leaflets 7 to 9; petioles slender, 1¼ to 2½ inches long; leaflets oblanceolate, apiculate, glabrous above, ½ to 1¾ inches long; peduncles about 2½ inches long; racemes lax, 4 to 5 inches long; pedicels 2 to 3 lines long; flowers 4½ to 5½ lines long; calyx not gibbous, upper lip short (about 1 to 1½ lines long), more or less 2-cleft with broad teeth, lower lip broad, entire, 2 lines long; petals violet; banner broadly oblong, the median sulcus covering over ½ of the upper margin of the wings, reflexed near the apex; keel broad, not much exposed, the upper margin ciliate, nearly straight; pods 1 to 1¼ inches long, 3½ to 4½ lines wide.—Siskiyou and Shasta Cos.: Spring Camp, *Jones & Alexander.* In habit it differs markedly from L. onustus, but is little known and much in need of further collection and field study.

LUPINUS GRACILENTUS Greene, Proc. Acad. Phila. 44:365 (1893), type loc. Tuolumne Cañon, *Chesnut & Drew:* Jepson, Man. 527 (1925); tall and slender; glabrate; racemes with 4 to 6 distinct whorls; acumen of the keel with a few hairs.

22. **L. laxiflorus** Dougl. SPUR LUPINE. (Fig. 184.) Plants 1 to 2 feet high, the stems slender, several to many from a woody branched root-crown; herbage with short appressed hairs; leaflets 6 to 8, narrowly oblanceolate to oblong-oblanceolate, mostly bright green, 1 to 2 inches long, the cauline petioles about as long to twice as long; basal and lower cauline petioles 4 to 7 inches long; racemes loose, slender, 3 to 4 inches long, the whorls definite or indefinite; bracts shorter than the calyx, mostly deciduous; pedicels 1 to 2 lines long; flowers 3 to 4½ lines long; calyx shortly spurred or saccate at base on the upper side, its lips ¼ to ⅓ as long as petals, the upper one slightly toothed, nearly as long as the entire lower one; petals blue; banner more or less pubescent on back, the center white, changing to buff; keel woolly-ciliolate; pods densely hirsute, 10 to 12 lines long; ovules 4 to 6.

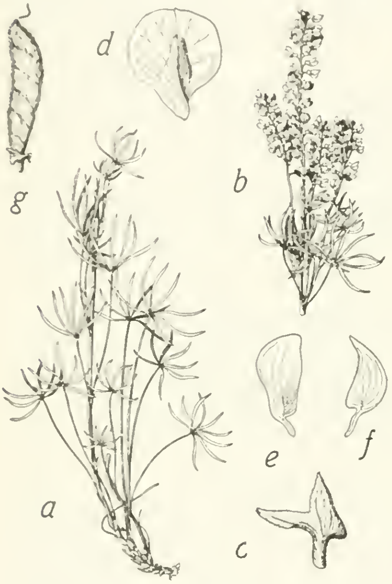

Fig. 184. LUPINUS LAXIFLORUS Dougl. *a*, base of plant, × ⅙; *b*, upper part of plant, × ⅙; *c*, calyx, × 2; *d*, banner, × 1½; *e*, wing, × 1½; *f*, keel, × 1½; *g*, pod, × ⅔.

Open hillslopes, open pine flats and valley floors, 2000 to 9500 feet: northern Sierra Nevada from Mono and Tuolumne Cos. to Modoc and Siskiyou Cos., chiefly east and north of the Sierra Nevada crest, occasional on the west slope. North to Idaho, east to Utah. May-July.

Locs.—Convict Creek, Mono Co., *Almeda Nordyke;* Spur, Alpine Co., *Hansen* 364; Sonora Pass, *A. L. Grant* 159; Deadman Creek, Tuolumne Co., *Jepson* 6572; Emerald Bay, Lake Tahoe, *Helen Geis;* Truckee, *Sonne;* Cisco, Placer Co.; Summit sta., Nevada Co., *Jepson* 42t, 59t; Mineral, *J. Grinnell;* Warner Valley, Plumas Co., *Jepson* 4062, 12,308; Jess Valley, Warner Mts., *L. S. Smith* 798; Surprise Valley, e. Modoc Co., *Jepson* 7841; Forestdale, sw. Modoc Co., *M. S. Baker;* Klamath Hills, near Yreka, *Butler* 705. White Mts.: Silver Cañon to Big Prospector Mdw., *Jepson* 7245.

Var. **calcaratus** C. P. Sm. Robust; petals yellowish-white, sometimes blue; calyx spur 1 line long.—East side of the Sierra Nevada from Inyo Co. to Modoc Co. East to Utah, north to eastern Oregon.

Locs.—Wells ranch ranger sta., Inyo Co., *Kennedy;* Long Valley, Inyo Co., *K. Brandegee;* Sonora Pass, *Brewer* 1891; mts. by Madeline Plains, Lassen Co., *Austin & Bruce* 2144; Bear Mt., Warner Mts., *L. S. Smith* 1048.

Var. **corymbosus** Jepson comb. n. Leaflets glabrous or subglabrous above; banner glabrous or slightly pubescent on back.—Butte Co. to Siskiyou Co.: Colby, Butte Co., *R. M. Austin;* Edgewood, *K. Brandegee;* Shasta Valley, *Butler* 1842. North to eastern Oregon.

Var. **inyoensis** Jepson comb. n. Pedicels densely pubescent with spreading hairs.—Inyo Co.: Inyo Mts., *Purpus* 5789; McGee Mdws., near Bishop, *K. Brandegee;* Bishop Creek, *Hall & Chandler* 7257.

Refs.—LUPINUS LAXIFLORUS Dougl.; Lindl. Bot. Reg. t. 1140 (1828), type loc. "great rapids of Columbia River", *Douglas*. *L. multitinctus* Nels. Bot. Gaz. 53:221 (1912), type loc. Big Willow near Falk's store, Cañon Co., Ida., *Macbride* 114. *L. variegatus* Hel. Muhl. 8:89 (1912), type loc. Ruby Mts., near Deeth, Elko Co., Nev., *Heller* 10,551. *L. laxiflorus* var. *silvicola* C. P. Sm.; Jepson, Man. 527 (1925). *L. silvicola* Hel. Muhl. 6:81, fig. 12 (1910), type loc. Summit, Placer Co., *Heller* 9857; banner not pubescent on back (ex char.) but spms. determined by Heller as L. silvicola have the banner pubescent on the back (Truckee; Independence Lake). *L. laxiflorus* var. *cognatus* C. P. Sm.; Jepson, Man. 527 (1925), type loc. Wallowa Mts., Ore., *Cusick* 3187. Var. CALCARATUS C. P. Sm. Bull. Torr. Club 51:304 (1924); Jepson, Man. 526 (1925). *L. calcaratus* Kell. Proc. Cal. Acad. 2:195, fig. 60 (1863), type doubtless from Cal. Var. CORYMBOSUS Jepson. *L. corymbosus* Hel. Muhl. 2:69 (1895), type loc. Montague, Siskiyou Co., *Heller* 8015; Jepson, Man. 527 (1925). Var. INYOENSIS Jepson. *L. inyoensis* Hel. Muhl. 2:211 (1906), Sierra Nevada foothills w. of Bishop, Inyo Co., *Heller* 8312. *L. inyoensis* var. *eriocalyx* C. P. Sm.; Jepson, Man. 527 (1925), type loc. e. of the Minarets, Madera Co., *Congdon;* calyx woolly-villous; banner woolly-pubescent on the back.

23. **L. caudatus** Kell. SILK LUPINE. Herbage appressed-silky or satiny; calyx densely silky-tomentose, its lips subequal, about ¾ as long as the petals; otherwise like L. laxiflorus Dougl.

Open dry slopes, 4000 to 8000 feet: foothills on east side of the Sierra Nevada from Inyo Co. to Modoc Co., thence west to Siskiyou Co. Western Nevada and eastern Oregon to southwestern Idaho. May-July.

Locs.—Maturango Peak, Argus Range, *Purpus* 5451; Lake Sebrina, Inyo Co., *Davidson* 2877; Mono Lake, *Congdon;* Boca, Nevada Co., *Sonne;* Portola, *K. Brandegee;* Honey Lake, *T. Brandegee;* Big Valley near Bieber, Lassen Co., *Baker & Nutting;* Silver Creek, Warner Mts., *L. S. Smith* 1035; Pine Creek, Warner Mts., *L. S. Smith* 974; Mt. Bidwell, Warner Mts., *Jepson* 7856; Goosenest foothills, e. Siskiyou Co., *Butler* 917.

Refs.—LUPINUS CAUDATUS Kell. Proc. Cal. Acad. 2:197, fig. 61, (1863); Jepson, Man. 527 (1925). *L. argentinus* Rydb. Bull. Torr. Club 30:257 (1903), type loc. Reno, Nev. (not "Utah"), *S. G. Stokes.*

24. **L. ludovicianus** Greene. BISHOP LUPINE. Stems leafy, branching from a woody base, 1 to 1½ feet high; herbage densely tomentose, the stems and petioles with some spreading hairs, the leaflets closely lanate; leaflets 4 to 8, oblong-obovate or oblanceolate, obtuse or acute, ¾ to 1½ inches long; petioles 1 to 4 inches long; racemes somewhat loose, 3 to 10 inches long, on rather long peduncles; flowers 4½ to 5 lines long, scattered or subverticillate, on pedicels 1 to 2 lines long; calyx-lips nearly equal, the upper bifid, the lower 3-toothed; corolla dark blue or purple; keel ciliate; pods densely pubescent, ¾ to 1 inch long, 4 to 6-seeded.

Cañons, 50 to 1500 feet: western San Luis Obispo Co. May.

Locs.—Price Cañon near San Luis Obispo, *K. Brandegee & I. J. Condit;* Arroyo Grande, *Alice King.*

Refs.—LUPINUS LUDOVICIANUS Greene, Bull. Cal. Acad. 1:184 (1885), type loc. mts. above San Luis Obispo, *Curran;* Jepson, Man. 527 (1925).

25. **L. breweri** Gray. MAT LUPINE. Dense prostrate mats ⅙ to 3 feet broad, the flowering stems 2 to 5 inches high, arising from a much-branched woody root-crown; herbage densely silvery-silky, the hairs appressed; leaflets 6 to 10, obovate to oblanceolate, obtuse (but often with an apiculate tuft of hairs), 3 to 6 (or 8) lines long, about ½ to ⅓ as long as the petioles; racemes commonly somewhat dense, ¾ to 3 inches long, the peduncles shorter than or exceeding the leaves; flowers 3 to 4 lines long; bracts short, deciduous; calyx-lips nearly equal, the upper deeply bifid, the lower minutely toothed or entire; petals blue, equal, 3 to 4 lines long; banner with a large white spot; keel broad, only slightly ciliate on upper part or near the middle or glabrous; pods 6 to 9 lines long, 2 or 3-seeded.

Rocky mountain summits, 6000 to 11,000 feet: San Gabriel Mts.; San Bernardino Mts.; Sierra Nevada from Tulare Co. to Lassen Co.; White Mts.; Siskiyou Co. June-July.

Locs.—S. Cal.: Mt. Waterman, San Gabriel Mts., *Peirson* 2441; Bear Valley, San Bernardino Mts., *Parish* 3737. Sierra Nevada: White Chief Peak, Tulare Co., *Culbertson* 4401; Big

Arroyo, Kern Cañon, *Jepson* 4987; Coyote Pass, Tulare Co., *Jepson* 983; Kaweah Mdws., Tulare Co., *Purpus* 5340; Kaiser Peak, Fresno Co., *Jepson* 13,026; Parker Pass, *A. L. Grant* 1595; El Capitan summit, *Jepson* 4363; Glacier Pt., Yosemite, *Congdon;* Virginia Cañon, Tuolumne Co., *Jepson* 4494; Strawberry, Tuolumne Co., *Jepson* 6495; Truckee, *Sonne;* Westwood jct., sw. Lassen Co., *C. S. Robinson.* White Mts.: North Fork Crooked Creek, *Jepson* 7339. Siskiyou Co.: Cuddihy Valley (ridge near), *Jepson* 2856. Short racemes are sometimes found in plants of high exposed peaks (var. parvulus C. P. Sm.), but plants with both short and long racemes on one individual are also found in such situations.

Var. **bryoides** C. P. Sm. Mats very dense and somewhat moss-like, 2 to 9 inches wide, the foliage pubescent and rusty-hirsute or drying rusty, equaling or nearly equaling the racemes; leaflets 1½ to 2 lines long.—Arid peaks or meadows bordering the Mohave Desert from Tulare Co. to northern Ventura Co., 8000 to 12,000 feet: Army Pass, Mt. Whitney, *W. P. Taylor;* Mt. Langley, *Purpus* 1676; Volcano Mdws.; Hockett trail summit near Little Cottonwood Creek, w. Inyo Co., *Jepson* 927; Monache Mdws.; Mt. Pinos, *J. Grinnell.*

Var. **grandiflorus** C. P. Sm. Stems very short (about ½ inch); leaves crowded at the base; petioles 1¾ to 2½ inches long; racemes exceeding the leaves; flowers scattered, 5 to 5½ lines long; banner much reflexed.—Mono Craters, Mono Co.

Refs.—LUPINUS BREWERI Gray, Proc. Am. Acad. 7:334 (1868), type loc. Yosemite trail, *Brewer* 1634; near Carson City, Nev., *Anderson;* Jepson, Man. 526 (1925). Var. *parvulus* C. P. Sm.; Jepson, l.c., type loc. Gold Lake, Sierra Co., *Hall & Babcock* 4507. Var. BRYOIDES C. P. Sm.; Jepson, l.c., type loc. Olancha Peak, Tulare Co., *Hall & Babcock* 5247. Var. GRANDIFLORUS C. P. Sm.; Jepson, l.c., type loc. Mono Craters, Mono Co., *R. S. Ferris* 1463.

26. **L. lyallii** Gray var. **lobbii** C. P. Sm. ALPINE LUPINE. (Fig. 185.) Alpine dwarf 1½ to 5 inches high, the peduncles and leaves basal or sub-basal, arising from a much-branched woody root-crown; herbage subappressed-hirsute; leaflets 5 to 7, oblanceolate to obovate, acutish, 3 to 7 (or 10) lines long, the petioles ½ to 1¼ inches long; racemes densely flowered, short-cylindric or subcapitate, ½ to 1 (or 2) inches long, the curved, spreading or erect peduncles mostly exceeding the leaves; flowers 3 to 5½ lines long; calyx-lips nearly equal, the lower one entire or 3-toothed, the upper cleft ¼ to ⅓; petals blue; banner elliptical; keel usually tipped with dark purple, ciliate at middle or upper part or non-ciliate; pods silky, 5 to 7 lines long, 1 to 4-seeded.

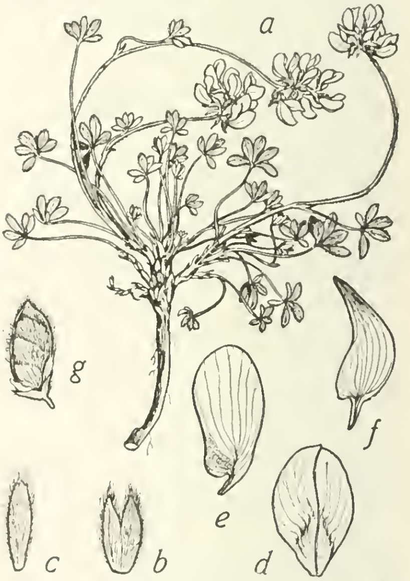

Fig. 185. LUPINUS LYALLII Gray. var. LOBBII C. P. Sm. *a*, habit, × ½; *b*, upper lip of calyx, × 2; *c*, lower lip of calyx, × 2; *d*, banner, × 2; *e*, wing, × 2; *f*, keel, × 2; *g*, pod, × 1.

Dry alpine summits, 7000 to 11,000 feet: Sierra Nevada from Tulare Co. to Nevada Co.; North Coast Ranges from eastern Mendocino Co. to Siskiyou Co. North to Washington. July-Aug.

Locs.—Sierra Nevada: Volcano Creek, e. Tulare Co., *Jepson* 958; Mono Pass, *Congdon;* Mt. Gibbs, *Congdon;* Dana Fork Tuolumne River, *Jepson* 3260; Kennedy Peak, *A. L. Grant* 545; Deadman Creek, Tuolumne Co., *Jepson* 6571; Sonora Peak, *A. L. Grant* 399; Echo Lake, Lake Tahoe, *H. M. Evans* (pubescence very dense); Bear Valley, Nevada Co., *Jepson* 1t. North Coast Ranges: South Yollo Bolly, *Jepson* 57t; Twin Peak to Thompson Peak, Trinity Co., *Alexander & Kellogg* 292; Black Butte, Sisson, *Blasdale* (racemes in the last two spms. not surpassing the foliage, the keel with woolly-ciliate band).

Var. **danaus** Wats. Alpine dwarf 1½ to 4 inches high; leaflets usually 3 lines long or less; flowers 3 to 4 lines long; petals white or pale lilac.—High peaks, 10,000 to 12,000 feet: Sierra Nevada from Mono and Tuolumne Cos. to Tulare Co. July-Aug.

Locs.—Mt. Dana, *Congdon;* Mt. Lyell, *Jepson* 3342; Mt. Whitney, *Purpus* 3064 (extreme form).

Var. **villosus** Jepson, var. n. Herbage extremely villous; leaflets 3 to 6 lines long; petals blue.—(Herbae villosissimae; foliola lin. 3–6 longa; petala caerulea.)—Subalpine, 8000 to 9000 feet: Sierra Nevada from Eldorado Co. to Fresno Co.

Locs.—Carson Pass, *Jepson* 8100 (type); Sonora Pass, *A. L. Grant* 161; Junction Mdws., Fresno Co., *E. Ferguson* 460.

Refs.—LUPINUS LYALLII Gray, Proc. Am. Acad. 7:334 (1868), type loc. summit of Cascade Mts., *Lyall;* Jepson, Man. 524 (1925). Var. LOBBII C. P. Sm.; Jepson, Man. 525 (1925). *L. aridus* var. *lobbii* Wats. Proc. Am. Acad. 8:533 (1873), type loc. "high Sierras of California", *Lobb. L. alpinus* Hel. Muhl. 6:22 (1910), type loc. Mt. Rose, Washoe Co., Nev., *Heller* 9914a. (?)*L. hypoleucus* Greene, Lflts. 1:74 (1904), type loc. near summit of White Chief Peak, *Culbertson* 4416. Var. DANAUS Wats. Proc. Am. Acad. 8:534 (1873); Jepson, Man. l.c. *L. danaus* Gray, l.c. 335, type loc. Mt. Dana, *Bolander.* Var. VILLOSUS Jepson.

27. **L. lepidus** Dougl. PRAIRIE LUPINE. Plants 7 to 13 inches high, the proper stems commonly very short or almost none, the peduncles and leaves in a basal or sub-basal tuft on the branched root-crown; herbage silky, the hairs either appressed or a little loose; leaflets 5 to 7, narrowly obovate or oblanceolate, ¾ to 1¾ inches long; petioles 2 to 10 inches long; racemes somewhat loose, 3 to 8 inches long, 8 to 11 lines wide, the peduncles 2 to 4 inches long, commonly not exceeding the leaves or very little; flowers 4½ to 5½ lines long; upper calyx-lip shortly bifid, the lower minutely toothed at apex; petals purple, blue, pink or white; keel woolly-ciliate; pods 4 to 6 lines long, 2 or 3-seeded.

Dry sandy plains, mountain slopes or valleys, 2000 to 4500 feet: east and north of the Sierra Nevada crest from Mono Co. to Modoc and Siskiyou Cos. North to Oregon and British Columbia. June-July.

Note on variation.—The far northern original of the species is a plant somewhat caulescent with the racemes moderately but not densely flowered. It is represented in California by mostly stemless plants east and north of the Sierra Nevada crest, but the more or less caulescent form with long dense racemes and short peduncles (var. confertus) intergrades continuously with it. Specimens of var. confertus from one locality (San Bernardino Mts., *Parish* 429, 3054) may have peduncles either shorter or longer than the stems, the racemes characteristically dense, or sometimes lax on the same plant. At the same altitude where the stemless form is found, and especially at higher altitudes, we also find plants that are less coarse or somewhat smaller with slightly narrower racemes. In the extreme phase of this high-montane form the peduncles are long enough to raise the racemes above the foliage (var. torreyi), but continuous variations of short or long peduncles, short or long proper stems, short or long racemes result in an array of forms not reducible to definitely distinct categories, more especially as there is also variation in degree of pubescence and in habit. A series of specimens collected by K. Brandegee (July 20, 1911) at the lower end of Donner Lake unquestionably represents one narrow genetic unit. Some have the dense racemes, short stems and long peduncles characteristic of L. lepidus var. torreyi, and all have the flowers within the size limits of this form. Other sheets show plants with either stems or peduncles, or both, greatly elongated, surpassing the lower leaves, and with the racemes as lax as those of typical L. lepidus. Hence, the supposedly diagnostic characters of L. aridus, L. confertus and L. torreyi and other more recently published forms are so intermingled that all as species must be reduced to L. lepidus. Lupinus lepidus may, therefore, be compared to a mountain plateau seamed and irregularly fissured by cañons but with small buttes rising above its general surface. The varieties described below may be likened to these buttes rising from the plateau, but such topographic points, it must be remembered, are much less in volume than the plateau mass into which they insensibly merge and unite in a broad way one with the others. Characters which have been used for segregation of the Lupinus lepidus allies, such as the relative lengths of stems, peduncles and lower leaves, might depend to a large extent upon ecological or climatic conditions. Plants of alpine or other strictly limiting habitats are of course likely to be reduced in stature but whether the greatest shortening occurs in stems, peduncles or petioles may possibly depend upon the stage of development reached by the plant when the unfavorable factor in the environment becomes effective. The following specimens are cited as L. lepidus.

Locs.—Edgewood, Siskiyou Co., *Lemmon;* Shasta Valley, *Hall* 4084; Walker Lake, Mono Co., *Jepson* 4447.

Var. **confertus** C. P. Sm. KELLOGG LUPINE. Stems stouter, longer (5 to 7 inches), the peduncles very short or almost none; racemes cylindrical, very dense, 3 to 9 inches long; pedicels stout, ⅕ to ½ line long; bracts usually persistent.—Mountain meadows and gravelly slopes, 3600 to 8300 feet: San Bernardino Mts.; Sierra Nevada from Mariposa Co. to Modoc Co. June-Aug.

Locs.—Bear Valley, San Bernardino Mts., *Parish* 3738; Fish Camp, Mariposa Co., *Jepson*

8394; Alder Creek to Peregoy Mdw., Mariposa Co., *Jepson* 4329; Little Yosemite, *Jepson* 3153; Big Mdws., Plumas Co., *R. M. Austin;* Honey Lake Valley, *Jepson* 7798; Big Valley, Modoc Co., *M. S. Baker.*

Var. **ramosus** Jepson var. n. Mono Lupine. Stems several from the root-crown, erect, 11 to 14 inches high, corymbosely branched above, sometimes even paniculately branched with many racemes; racemes short, 1 to 2½ (or 4) inches long.—(A caudice caules aliquot erecti, unc. 11–14 alti, supra corymboso-ramosi vel paniculato-ramosi; racemi breves, unc. 1–2½ longi.) —East side of the Sierra Nevada in Mono Co., 4000 to 8000 feet: Lundy, *Maud Minthorn;* Walker Lake, *Congdon;* Mono Lake, *Congdon* (type).

Var. **torreyi** Jepson comb. n. Torrey Lupine. Plants usually 8 to 12 inches high, the proper stems often much shortened; leaflets 6 to 12 lines long; peduncles usually elongated, lifting the racemes above the foliage; racemes dense, usually 2 to 4 inches long.—Mostly dry soil, 1000 to 9500 feet: Sierra Nevada from Tulare Co. to Siskiyou Co.; Humboldt Co. North to eastern Washington. June-Aug.

Locs.—Upper Funston Mdw., Chagoopa Plateau, Kern Cañon, *Jepson* 5006; Soda Sprs., North Fork San Joaquin River, *Congdon;* Rancheria Mt., Tuolumne Co., *Jepson* 4605; Douglas Flat, Tuolumne Co., *A. L. Grant* 101; Dorrington, Calaveras Co., *Jepson* 10,056; Big Mdw. near Onion Valley, Calaveras Co., *Jepson* 10,090; Yuba River near Cisco, Placer Co., *H. A. Walker* 1483; Donner Lake, *Heller* 6864; Sierra Valley, *Jepson* 8035; Mineral, Tehama Co., *J. Grinnell;* Black Butte, Mt. Shasta, *Jepson* 9t; White Thorn Valley, Humboldt Co., *Tracy* 5021.

Var. **aridus** Jepson comb. n. Oregon Lupine. Plants 4 to 10 inches high, the proper stems much shortened, decumbent or ascending; leaves sub-basal, sometimes crowded; leaflets 5 to 10 lines long; racemes 1 to 4 inches long, usually not completely surpassing the foliage.—Sandy soil, ridges and meadows, 3000 to 6600 feet: Trinity, Siskiyou, Modoc and Butte Cos. North to Washington. June-Aug.

Locs.—Hayfork Mt., Trinity Co., *Tracy* 6460; Shackelford Cañon, Siskiyou Co., *Chandler* 1727; Colby, Butte Co., *R. M. Austin;* Modoc Co., *M. S. Baker.*

Var. **artulus** Jepson var. n. Plumas Lupine. Racemes narrow, 2 to 3 inches long, 6 to 7 lines wide; petals turning black-purple in age; keel densely woolly-ciliate on upper half.—(Racemi angusti, unc. 2–3 longi, lin. 6–7 lati; petala in aetate purpureo-nigra; carina dimidio superiore dense ciliato-lanata.)—Warner Valley, Plumas Co., *Jepson* 4069 (type).

Var. **culbertsonii** C. P. Sm. Kaweah Lupine. Proper stems either short or to 7 inches long; racemes with the lower flowers suberect after anthesis.—Kaweah River headwaters: Farewell Gap, Tulare Co., *Jepson* 1017; Summit Lake, *Culbertson* 4552; Mt. Silliman, *K. Brandegee.*

Refs.—Lupinus lepidus Dougl. Bot. Reg. t. 1149 (1828), type from "North-West America", *Douglas.* Var. confertus C. P. Sm. Bull. Torr. Club 51:304 (1924). *L. confertus* Kell. Proc. Cal. Acad. 2:192, fig. 59 (1863), type loc. not stated; Jepson, Man. 525 (1925). *L. sellulus* Kell. l.c. 5:36 (1873), type loc. Donner Lake, *Kellogg.* Var. ramosus Jepson. Var. torreyi Jepson. *L. torreyi* Gray; Wats. Bot. King 58 (1871), type loc. near Washoe Lake, Nev., *Torrey* 82; Jepson, Man. 525, fig. 520 (1925). *L. aridus* var. *torreyi* C. P. Sm. l.c. 303. Var. aridus Jepson. *L. aridus* Dougl. Bot. Reg. t. 1242 (1829), type loc. "Great Falls, Columbia River, to the sources of the Missouri", *Douglas. L. volutans* Greene, Muhl. 8:118 (1912), type loc. Malheur Valley, sw. Ore., *Leiberg.* Var. artulus Jepson. Var. culbertsonii C. P. Sm. l.c. 304. *L. culbertsonii* Greene, Lflts. 1:73 (1904), type loc. South Fork Kaweah River, 8000 ft. (misprinted "Forks of the Kaweah River"), *Culbertson* 4475. *L. hypolasius* Greene, l.c. 74, type loc. Farewell Gap, Tulare Co., *Purpus* 5221 (flowers 3 lines long); Jepson, Man. 525 (1925).

28. **L. pratensis** Hel. Inyo Lupine. Stems stout, hollow, leafy, several from the root-crown, forming a clump 2 to 2½ feet high; herbage a little succulent, scantily appressed-villous or even subglabrate, the pedicels and calyces densely villous; leaflets 6 to 8, oblong-oblanceolate, 1¼ to 2½ inches long, the lower petioles 2½ to 5 inches long, the upper ones about 1 inch long; racemes 3 to 10 inches long, much crowded, the flowers in definite whorls; bracts ovate-lanceolate or lanceolate, hairy-pubescent, persistent, about equaling the calyx; calyx-lips subequal, the lower entire, the upper shortly cleft; corolla purple, 4 to 5½ lines long, the banner glabrous, the keel somewhat woolly-ciliate; pods hairy, 5 to 9 lines long, 4 or 5-seeded.

Moist sandy flats or wet meadows, 5000 to 9000 feet: east slope of the Sierra Nevada in Mono and Inyo Cos.; headwaters of South Fork San Joaquin River and of South Fork Kings River. May-July.

Locs.—Bishop Creek, *K. Brandegee;* Andrews Camp, *K. Brandegee;* Lake Sabrina, Inyo Co., *Davidson* 2880; Onion Mdw., *Ralph Gibbs;* Bubbs Dome, *Jepson* 797; Jackass Mdw., Lake Florence, South Fork San Joaquin River, *Jepson* 16,061.

Var. **eriostachyus** C. P. Sm. Young racemes creamy-woolly, the bracts inconspicuous; banner dark purple, pubescent on the back, wings pale blue.—Big Pine Creek, Inyo Co., 9000 feet.

Refs.—Lupinus pratensis Hel. Muhl. 2:210 (1906), type loc. McGee Mdws. w. of Bishop, Inyo Co., *Heller* 8364; Jepson, Man. 525 (1925). Var. eriostachyus C. P. Sm.: Jepson, l.c., type loc. Big Pine Creek, Inyo Co., *Peirson* 530.

29. **L. covillei** Greene. Shag Lupine. (Fig. 186.) Plants 1 to 2 feet high, the stems stoutish, leafy, several from the root-crown; herbage shaggy-villous; leaflets 4 to 7, lanceolate, acuminate, 1 to 4 inches long, longer than the petioles or often a little shorter, the very narrowly lanceolate-attenuate stipules ½ to ¾ inch long; peduncles ½ to 1¼ inches long, not surpassing the uppermost leaves; racemes 3 to 6 inches long, dense or interrupted, the flowers scattered or in whorls; persistent bracts and conspicuous bractlets linear or filiform, equaling or exceeding the flowers; flowers 6 to 7 lines long; upper calyx-lip slightly bifid, the lower entire or obscurely 3-toothed, slightly longer; petals light blue; keel sparsely ciliolate on upper margins at base of acumen, or glabrous; pods densely hairy, about 1 inch long.

Rocky mountain slopes or lake shores, 8000 to 10,000 feet: Sierra Nevada from Tuolumne Co. to Tulare Co. June-Aug.

Locs.—Tilden Cañon, Tuolumne Co., *Jepson* 4542; Seavey Pass, Tuolumne Co., *Jepson* 4521; Lake Tenaya, *Brewer* 1691; Kaiser Peak, Fresno Co., *A. L. Grant* 1429; Blossom Lakes, Tulare Co., *W. Fry* 429; Farewell Gap, Tulare Co., *Jepson* 1015, 1141.

Refs.—Lupinus covillei Greene, Proc. Acad. Phila. 44:365 (1893), type loc. Farewell Gap, *Coville & Funston* 1746; Jepson, Man. 526 (1925). *L. dasyphyllus* Greene, Lflts. 1:73 (1904), type loc. Farewell Gap, Tulare Co., *Culbertson* 4272.

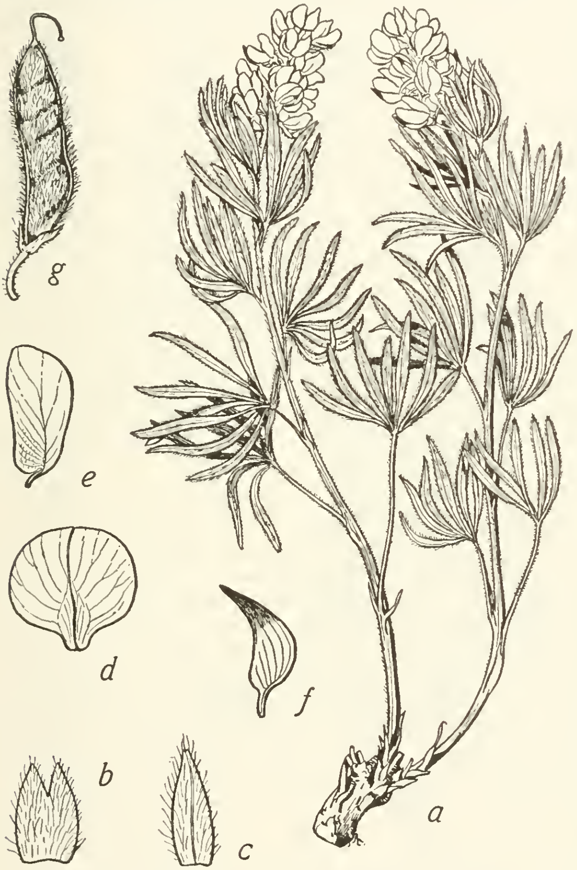

Fig. 186. Lupinus covillei Greene. *a*, habit, × ⅓; *b*, upper lip of calyx, × 2; *c*, lower lip of calyx, × 2; *d*, banner, × 1½; *e*, wing, × 1½; *f*, keel, × 1½; *g*, pod, × 1.

30. **L. peirsonii** Mason. Lone Lupine. Plants 16 to 22 inches high, the stems many from the branched root-crown, ascending, very short (3 to 5 inches); herbage with appressed or ascending pubescence, the leaflets finely white-silky; leaflets 7, oblong-oblanceolate, obtuse but mucronate, ¾ to 1¾ inches long; petioles 1 to 4 inches long; racemes rather dense, 1½ to 4 inches long, narrow (11 to 12 lines

broad); flowers 5 to 6 lines long; pedicels stout, ½ line long; calyx white-silky, the upper lip shortly bifid, the lower entire, rounded at apex; petals yellow; banner glabrous, emarginate at apex; keel straight, very broad (2 lines wide), ciliate at the middle or above, the acumen very short and blunt; ovules 3 to 5; fruit unknown.

Loose rocky soil in cañons: desert slope of the San Gabriel Mts. (Rock Creek, 4250 feet). Apr. So far as known, a highly localized and well-marked endemic.

Ref.—LUPINUS PEIRSONII Mason, Madroño 1:187 (1928), type loc. Rock Creek cañon, n. slope San Gabriel Mts., *Mason* 3026.

31. **L. leucophyllus** Dougl. POISON LUPINE. (Fig. 187.) Plants 1½ to 3 feet high, the stems stout, leafy, few or several from a branched root-crown; stem and petioles shaggy-tomentose, the leaflets densely silky-velvety; stipules subulate; leaflets 7 to 10, oblanceolate, acute, 1 to 2¾ inches long; the lower petioles 3 to 9 inches long, the uppermost about equaling or shorter than the leaflets; racemes dense, ½ to 1 foot long, usually shortly or not at all peduncled; flowers 4 to 6 lines long, in more or less indistinct whorls; pedicels stout, 1 to 1½ lines long; calyx subsaccate at base on upper side; lower lip minutely 3-toothed at apex, longer than the deeply cleft upper lip; petals blue, pink or dingy lavender; banner villous on the back, shorter than the wings; keel ciliate; pods ¾ to 1⅛ inches long, silky, 4-seeded.

Dry valleys or montane summits, often in red gravelly or volcanic soil, 2700 to 5300 feet: western Colusa Co. to Shasta and Siskiyou Cos., thence east to Lassen Co. Eastern Washington and Oregon to New Mexico. May-July.

Note on variation.—Variation in Lupinus leucophyllus does not well lend itself to definite segregation into named forms. The pubescence varies in length and density rather than in character. The northern plant originally described was apparently similar to Trinity County specimens, the short villous or sub-tomentose layer almost obscured by long spreading hairs. In most specimens of var. belliae C. P. Sm., the long hairs are less abundant and in var. canescens C. P. Sm. are absent. The bracts are either longer or shorter than the calyx. The form called L. plumosus Dougl. is conspicuously long-bracted, and in the illustration accompanying the original description of L. leucophyllus Dougl. the bracts are evident. The plants are also quite easily segregated into many larger- and smaller-flowered races, the latter more common interiorly. Flower size is, however, not associated constantly with other characters, the result being that the requirements described for var. belliae C. P. Sm. bring together unlike races. Var. canescens C. P. Sm. combines three segregating characters and is here accepted.

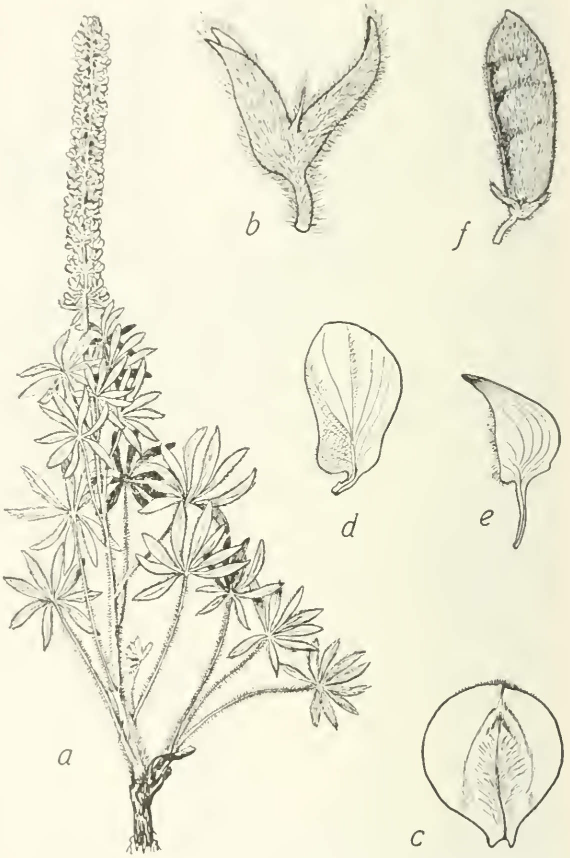

Fig. 187. LUPINUS LEUCOPHYLLUS Dougl. *a*, habit, × ⅕; *b*, calyx, × 1½; *c*, banner, × 1½; *d*, wing, × 1½; *e*, keel, × 1½; *f*, pod, × 1.

Locs.—Colusa Co. (Jepson, Man. 526); Rush Creek, Trinity Co., *H. S. Yates* 407; Hayfork Mt., Trinity Co., *Tracy* 6429 (bracts conspicuously long and slender as in illustration of the type); Mt. Shasta, *W. A. Dayton;* Klamath River near Yreka, *Butler* 703; Klamathon, *Copeland* 3518; Dana, ne. Shasta Co., *Hall & Babcock* 4181; Eagle Lake, *Baker & Nutting;* Burney Valley, Shasta Co., *M. S. Baker;* Egg Lake, Modoc Co., *Nutting.*

Var. canescens C. P. Sm. Pubescence mostly or all short and appressed; leaflets 8 to 12, often narrower than in the species; flowers 4 to 5 lines long.—Dry soil, 4000 to 5000 feet: Lassen Co. (Pine Creek, *Baker & Nutting*); Modoc Co. North to eastern Washington.

Refs.—LUPINUS LEUCOPHYLLUS Dougl.; Lindl. Bot. Reg. t. 1124 (1827), type loc. "Great Falls of the River Columbia in North America to the sources of the Missouri among the Rocky Mountains", *Douglas;* Jepson, Man. 526 (1925). *L. plumosus* Dougl.; Lindl. Bot. Reg. t. 1217 (1829), "common in northern California, in 45° north" (i. e. Oregon), *Douglas*, flowers larger, less crowded, bracts long, shaggy, deciduous (ex char.). Var. CANESCENS C. P. Sm. Bull. Torr. Club 51:306 (1924). *L. canescens* Howell, Erythea 1:110 (1893), type loc. Buck's Mt., spur of Blue Mts., Ore., *Howell* 787; Jepson, Man. 526 (1925). *L. leucophyllus* var. *belliae* C. P. Sm. l.c. 51:305, type loc. Crystal Creek, Power Co., Idaho, *Zundel.*

SECTION 2.—Annuals.

32. **L. pachylobus** Greene. BIG-POD LUPINE. Stem branching from the base, 4 to 10 inches high; herbage conspicuously villous; leaflets 6 to 8, ½ to 1 inch long, hairy both sides; petioles ¾ to 2 inches long; racemes with 2 to 4 whorls, or the flowers sometimes scattered; flowers 3 to 4 lines long; pedicels ½ to 1 line long; petals blue; banner suborbicular, 2½ to 3 lines wide, with a white center; keel nonciliate or nearly so; pods rusty-hirsute, especially large, thick and succulent when green, 1 to 1¼ inches long, 3½ to 4½ lines wide; ovules 4 to 6.

Grassy hills, 175 to 2000 feet: San Mateo Co. to Napa Co., thence south in the Sierra Nevada foothills from Butte Co. to Eldorado Co. Apr.-May.

Locs.—Woodside, San Mateo Co. (Bull. Torr. Club 51:95); Mt. St. Helena, *Greene;* Chico, *Copeland* 3043; Pilot Hill, Eldorado Co., *K. Brandegee.*

Refs.—LUPINUS PACHYLOBUS Greene, Pitt. 1:65 (1887), type loc. Briones Hills, e. of San Pablo Creek, Contra Costa Co., *Greene;* Jepson, Man. 522 (1925). *L. micranthus* var. *pachylobus* Jepson, Fl. W. Mid. Cal. 318 (1901), ed. 2, 219 (1911).

33. **L. nanus** Dougl. SKY LUPINE. Plants erect, 6 to 15 inches high, the stems slender, 1 or several from the base; herbage spreading-hirsute, or the leaves somewhat appressed-hirsute; leaflets 5 to 7, linear to oblanceolate, usually acute, ½ to 1¼ inches long; racemes 2½ to 5 inches long, with well-separated whorls, the flowers in definite whorls or sometimes a little indefinite; bracts deciduous; pedicels 2½ to 3 lines long; flowers 6 lines long; lower calyx-lip truncatish, sometimes obscurely toothed or 3-toothed; upper calyx-lip bifid, its lobes ovate, acute; corolla blue; banner broadly orbicular, the sides retuse, the center with a marked sulcus, the white central spot turning purple in age; wings lightly joined at tip, forming a sort of inflated sac; keel slender throughout, acumen strongly upturned, the tip jet-black, ciliate above the middle; pods 1 to 1⅜ inches long; seeds 5 to 11.

Grassy hills and sandy fields, 100 to 2000 feet: Coast Ranges from Mendocino Co. to Santa Barbara Co.; Sierra Nevada foothills from Amador Co. to Calaveras Co. Apr.-May.

Locs.—Coast Ranges: Ukiah, *Purdy;* St. Helena, *Jepson* 29t, 60t, 6241; Yountville, *Jepson* 20t; Atlas, Napa Co., *Mary Ferguson;* Mt. Tamalpais, *Jepson* 7558; Olema, Marin Co., *Jepson* 8288; San Francisco, *Jepson* 2639; Hunters Pt. *Jepson* 12,709; Alameda, *Jepson* 50t; Carmel, *Newlon* 110; Santa Margarita, *Jepson* 11,974; Edna, San Luis Obispo Co., *Jepson* 12,685. Santa Barbara Co.: Purisima Hills, *Jepson* 12,661. Sierra Nevada foothills: Ione, Amador Co., *Jepson* 15,210; Gwin Mine, Calaveras Co., *Jepson* 1803.

Var. **carnosulus** C. P. Sm. RAVEN LUPINE. Largest leaflets 1 to 1¾ inches long; pods 1¼ to 2 inches long, 3½ to 4½ lines wide; seeds about 2¼ lines long.—Santa Clara Co. to Humboldt Co.: Los Gatos, *Heller* 7298; Mill Valley, Marin Co., *Jepson* 34t; Bridgeville, Humboldt Co., *Tracy* 7053.

Var. **menkerae** C. P. Sm. KERN LUPINE. Leaflets 5 to 8½ lines long, 1 to 1½ lines wide; flower 5 to 6 lines long; petals pale lilac, drying blue; banner emarginate; pods 10 to 12 lines long, barely 1½ to 1¾ lines wide, ovules 9 to 12; seeds pale flesh-color.—Sandy plains, upper San Joaquin Valley in Kern Co. and western Fresno Co.: Sivert sta., Kern Co., *Jepson* 11,607; Bena, Kern Co., *Jepson* 11,613; Caliente, *Jepson* 6758; Rose sta., *Jepson* 8939, 12,425a; Coalinga, sw. Fresno Co., *Jepson* 15,351. At the head of the San Joaquin Valley, on the sloping plain near Tejon Pass and on the plain between Bakersfield and Caliente, this variety, in a favorable spring, covers many thousands of acres with a fairly uniform stand, forming a color spectacle not matched by any other Lupini. Individuals often have numerous stems from the base which branch low, forming dense clumps 10 to 18 inches high and 2 to 4 feet broad.

Var. vallicola C. P. Sm. Flowers 3 to 5 lines long; banner little reflexed, making an acute angle with the upper margins of the wings (that is, corolla "notch" slight); keel strongly curved; seeds pale.—Grassy gravelly banks, 50 to 5000 feet: Sierra Nevada foothills from Shasta Co. to Kern Co.

Locs.—Happy Valley, Shasta Co., *Blankinship;* Pilot Hill, Eldorado Co., *Jepson* 15,763; Avery sta., Calaveras Co., *A. L. Grant;* Five Mile Creek, South Fork Stanislaus River, *A. L. Grant* 734; Wawona, *Jepson* 8386; Bootjack, Mariposa Co., *Jepson* 12,783; Fresno Flats, *Jepson* 12,851; North Fork, Madera Co., *Noddin;* Greenhorn Range (Bull. Torr. Club 50:169).

Var. apricus C. P. Sm. Flowers 3 to 4 lines long; banner apex well reflexed from upper edges of wings (that is, corolla "notch" strong); pods 7 to 12 lines long; seeds dark.—Open grassy fields, valleys and foothills, 50 to 2000 feet: Santa Barbara Co.; Monterey Co. to Trinity and Shasta Cos.; Sierra Nevada foothills. North to southwestern Oregon.

Locs.—Jolon (Bull. Torr. Club 50:170); Halls Valley, Mt. Hamilton, *Jepson* 8232; Sonoma Valley, *Jepson* 5801; Gates Cañon, Vaca Mts., *Jepson* 14t; Vacaville, *Jepson* 72t; Peaceful Glen, nw. Solano Co., *Jepson* 9609; Calistoga (e. of, on Pope Valley grade), *Jepson* 22t); South Fork Mill Creek, Ukiah, *Jepson* 9233; Red Bluff, *Jepson* 30t; Weaverville, *Yates* 292; Anderson, Shasta Co. (Bull. Torr. Club 50:171); New York Creek, Eldorado Co., *Jepson* 15,765.

Refs.—LUPINUS NANUS Dougl.; Benth. Trans. Hort. Soc. Lond. ser. 2, 1:409 (1835), type cult. in England, seeds from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. 317 (1901), ed. 2, 218 (1911), Man. 522 (1925). *L. affinis* Agardh, Syn. Gen. Lup. 20 (1835), type from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. l.c., ed. 2, l.c. *L. nanus* var. *perlasius* C. P. Sm. Bull. Torr. Club 50:164 (1923), type loc. Mariposa-Coulterville Road, Mariposa Co., *Congdon* (densely villous ex char.); Jepson, Man. l.c. Var. CARNOSULUS C. P. Sm. l.c. 165; Jepson, Man. l.c. *L. carnosulus* Greene, Bull. Cal. Acad. 2:144 (1886), type loc. near Olema, Marin Co., *Greene.* *L. affinis* var. *carnosulus* Jepson, Fl. W. Mid. Cal. l.c., ed. 2, l.c. Var. MENKERAE C. P. Sm. l.c. 167, type loc. Bakersfield, Kern Co., *Heller* 7588; Jepson, Man. l.c. Var. VALLICOLA C. P. Sm. l.c. 168; Jepson, Man. l.c. *L. vallicola* Hel. Muhl. 4:40 (1908), a new name for *L. persistens* Hel., Muhl. 2:62 (1905), type loc. Redding, *Heller* 7850; not L. persistens Rose (1905). Var. APRICUS C. P. Sm. l.c. 170; Jepson, Man. l.c. *L. apricus* Greene, Lflts. 2:67 (1910), type loc. "middle California", *Baker* 610 (near Stanford; cf. Muhl. 6:135). *L. vallicola* var. *apricus* C. P. Sm. Muhl. 6:135 (1911); Jepson, Man. l.c. *L. hirsutulus* Greene, Lflts. 2:152 (1911), type loc. Beacon Hill, Vancouver Isl., *Macoun.*

34. **L. bicolor** Lindl. DOVE LUPINE. Stems 1 to several from the base, erect to diffuse, 4 to 16 inches high; herbage villous, the leaves pubescent on both sides; leaflets 5 to 8, oblanceolate, 5 to 10 lines long; raceme with 1 to 3 remote or discrete whorls, the flowers rarely scattered; flowers 2 to 4 lines long; lower calyx-lip entire to 3-toothed; upper calyx-lip cleft into 2 broadly lanceolate acuminate lobes; corolla blue, the banner with a central white spot; wings narrow; keel slender, the acumen strongly bent upward, ciliate on upper edge; pods densely hairy, 7 to 10 lines long; ovules 5 to 7.

Sandy or clay soils, grassy hills and valley levels, 20 to 2000 feet: nearly throughout cismontane California. North to British Columbia, south to Lower California. Mar.-May.

Note on variation.—This assemblage is on the whole very uniform in habit and inflorescence. It is variable in pubescence of the herbage, slightly so in size of the flower, in number of cilia on the keel, and in the degree of dentition of the lower lip. The published varieties on the whole represent the limits of variation in these particulars rather than well-established geographic races. When the lower lip is somewhat definitely 3-dentate, then the plant becomes var. tridentatus Eastw., but this character is variable and the form has no definite geographic significance, nor has var. microphyllus C. P. Sm. in which the flowers are slightly smaller than in the typical form of the species. In var. trifidus C. P. Sm., the lower calyx-lip is 3-lobed about halfway down, a somewhat more extreme state associated with sandy soil along the coast from San Francisco to Monterey. The keel is often only slightly ciliate and in var. pipersmithii C. P. Sm. this organ loses its last few hairs according to the character. The var. tetraspermus C. P.

Sm. appears to be a shade form, while in var. umbellatus C. P. Sm., of the arid Santa Cruz Isl., the whorls are reduced to 1 or 2. Blue, pink and white-flowered individuals of L. bicolor are not infrequently found together in one small colony of a given strain, the plants evidently being of common parentage. The specimens cited below are fairly typical of the species.

Locs.—S. Cal.: Vallecito, e. San Diego Co., *Jepson* 8544; Descanso, San Diego Co., *Munz & Harwood* 7138; Colton, *Parish;* Los Angeles, *Davidson;* Henniger Flats, San Gabriel Mts., *Peirson* 91. Sierra Nevada foothills: Kaweah, *W. Fry;* Limekiln Creek, Tulare Co., *Jepson* 2803; Pinehurst, *Newlon* 178; Table Mt., Fresno Co., *Jepson* 15,127; Fresno Flats, Madera Co., *Jepson* 12,852; Chowchilla School, Mariposa Co., *Jepson* 12,793; Columbia, Tuolumne Co., *A. L. Grant* 684; Salmon Falls, Eldorado Co., *Jepson* 15,753. Great Valley: Bena, Kern Co., *Jepson* 11,614; Berenda, Madera Co., *Jepson* 15,160; Patterson, Stanislaus Co., *Jepson* 11,570; Knights Ldg., Yolo Co., *Nutting;* Sutter plains, Marysville Buttes, *Jepson* 13t; Crane Creek hills, w. Tehama Co., *Jepson* 3t. Coast Ranges: Zapato Chino, sw. Fresno Co., *Jepson* 15,379; Priest Valley, San Benito Co., *Jepson* 2685; Cholame Valley, *Jepson* 15,406; San Miguelito Rancho, Jolon, *Jepson* 1635; Mt. Davidson, San Francisco, *Jepson* 10,361; Alameda, *Jepson,* 49t; Mill Valley, Marin Co., *Jepson* 31t; Conn Valley, Napa Range, *Jepson* 6265; St. Helena, *Clara Hunt;* Sonoma Valley, *Jepson* 5802; Bucksport, Humboldt Co., *Tracy* 838; Yreka, *Butler* 1190.

Var. **trifidus** C. P. Sm. Lower lip 3-cleft halfway.—Sandy soil, near the coast, San Francisco to Monterey; Alameda, *Greene;* San Francisco, *Davy* 1169; Pacific Grove, *Tidestrom.*

Var. **rostratus** Jepson comb. n. Flowers small (2 lines long); upper calyx-lip very deeply cleft, the teeth displaced and approximating those of the lower lip, so that the upper lip appears to be absent; banner ovate; wings narrow, produced into slender points which become revolute; keel with a slender beak.—Estrella plain, San Luis Obispo Co., *Jared.*

Refs.—LUPINUS BICOLOR Lindl. Bot. Reg. t. 1109 (1827), type loc. "interior . . . from Ft. Vancouver to the branches of Lewis and Clarke's River", *Douglas;* Jepson, Man. 522 (1925). *L. micranthus* var. *bicolor* Wats. Proc. Am. Acad. 8:536 (1873); Jepson, Fl. W. Mid. Cal. 317 (1901), ed. 2, 219 (1911). *L. sabulosus* Hel. Muhl. 7:9 (1911), type loc. Marine Hospital, San Francisco, *Heller* 6627. *L. strigulosus* Gandg. Bull. Soc. Bot. France 60:461 (1913), type loc. Bingen, Wash., *Suksdorf* 5928. *L. bicolor* var. *umbellatus* C. P. Sm. Bull. Torr. Club 50:377 (1923); Jepson, Man. 523 (1925). *L. umbellatus* Greene, Bull. Cal. Acad. 2:145 (1886), type loc. Santa Cruz Isl. (racemes with a single whorl). *L. bicolor* var. *tridentatus* Eastw.; C. P. Sm. Bull. Torr. Club l.c., type loc. Santa Rosa, Sonoma Co., *Eastwood* 10,369 (lower calyx-lip tridentate). *L. bicolor* var. *pipersmithii* C. P. Sm. l.c. 380; Jepson, Man. l.c. *L. pipersmithii* Hel. Muhl. 7:93, figs. 16, 17 (1911), type loc. Cedro Cottage field, near Stanford, San Mateo Co., *C. P. Smith* 1403 (keel non-ciliate). *L. bicolor* var. *microphyllus* C. P. Sm. l.c. 382 (flowers 2 to 2½ lines long); Jepson, Man. l.c. fig. 519. *L. micranthus* var. *microphyllus* Wats. Proc. Am. Acad. 8:535 (1873), type loc. San Diego. *L. bicolor* var. *tetraspermus* C. P. Sm. l.c. 385, type loc. Wright, Santa Clara Co., *C. P. Smith* 3405 (pods regularly 4-seeded); Jepson, Man. l.c. Var. TRIFIDUS C. P. Sm. l.c. 386; Jepson, Man. l.c. *L. micranthus* var. *trifidus* Wats. l.c., type loc. San Francisco, "various collectors and recently . . . *Vasey*" (lower calyx-lip trifid); Jepson, Fl. W. Mid. Cal. 318 (1901), ed. 2, 219 (1911). Var. ROSTRATUS Jepson. *L. rostratus* Eastw. Proc. Cal. Acad. ser. 2, 6:424, pl. 56 (1896), type loc. Estrella, *L. Jared.*

35. **L. micranthus** Dougl. Field Lupine. Stem with several or many stoutish branches from the base or above the middle, 6 to 11 inches high; herbage somewhat succulent, pubescent; leaflets 6 to 8, linear-oblanceolate, ⅓ to 1 inch long; racemes narrow, short (1 to 2¼ inches long), the few whorls remote or the flowers somewhat scattered; pedicels 1 line long, ascending; upper calyx-lip deeply 2-cleft, the lobes ovate or lanceolate, the lower lip entire or obscurely dentate, somewhat longer; flowers 1½ to 3 lines long; corolla deep blue; banner obovate, retuse or truncate, the center white with dark dots, changing to red-purple, the sides incurved, not reflexed; keel nearly straight, obscurely ciliate below the apex; pods rigid, lightly falcate, 8 to 12 lines long, 6 to 9-seeded.

Rich or clay soils of plains or low valleys, 10 to 3300 feet: San Diego Co. to the San Francisco Bay region (where frequent) and north to Humboldt Co., thence east to Plumas and Modoc Cos. Far north to British Columbia. Apr.-May.

Locs.—Adin, Modoc Co., *L. S. Smith* 918; Bucksport, Humboldt Co., *Tracy* 3251; Calistoga, *C. F. Baker* 1988; Crystal Springs Lake, *C. F. Baker* 1931; Howell Mt., *Jepson* 10,317; Vacaville, *Jepson* 10t; Mt. Davidson, San Francisco, *Jepson* 10,354; Purisima Hills, Santa Barbara Co., *Jepson* 12,655; Hemet, w. Riverside Co., *C. F. Baker* 4100; Mesa Grande, San Diego Co., *E. Ferguson* 23.

Var. **congdonii** C. P. Sm. Plants erect, 2 to 3 inches high; leaflets spatulate, pubescent both sides, 2 to 3 lines long, on petioles 5 to 12 lines long; racemes few-flowered, ½ to 1 inch long.—Mariposa Co. (Big Oak Flat).

Refs.—LUPINUS MICRANTHUS Dougl.; Lindl. Bot. Reg. t. 1251 (1829), type loc. southern tributaries of the Columbia ... and in the interior of California" (not Cal. of today), *Douglas;* Jepson, Fl. W. Mid. Cal. 317 (1901), ed. 2, 219 (1911), Man. 523 (1925). *L. polycarpus* Greene, Pitt. 1:171 (1888), type loc. vicinity of San Francisco; Jepson, Fl. W. Mid. Cal. 318 (1901), ed. 2, 219 (1911). *L. polycarpus* var. *grandiflorus* Dav. & Mox. Fl. S. Cal. 187 (1923), type loc. Riverside near Burbank Road, *Payne.* Var. CONGDONII C. P. Sm. Bull. Torr. Club 51:99 (1924), type loc. Smith Ranch, Big Oak Flat, Yosemite road, *Congdon.*

36. **L. succulentus** Dougl. ARROYO LUPINE. Stem stout, hollow and succulent, branching mostly from the middle, 14 to 20 inches (or to 3½ feet) high; herbage lush, glabrate or sparsely puberulent, the leaflets glabrous above; leaflets 7 to 9, oblong-oblanceolate or broadly cuneate-obovate, obtuse or retuse, 1 to 2 inches long; petioles 1½ to 4 inches long; racemes short-peduncled, 5 to 7 inches long, the whorls subverticillate, discrete or approximate; flowers spreading in anthesis, ascending later, 6 to 8½ lines long; bracts early deciduous; pedicels 2 to 3 lines long, spreading-pubescent; upper calyx-lip deeply cleft, the lower lanceolate lip entire or 3-toothed; petals deep blue to almost white; banner with yellow center turning violet; wings slightly ciliate at the base above, keel glabrous but ciliate near claws both above and below; pods long, appressed-pubescent, divaricate, 1¼ to 2 inches long, 2 to 3½ lines wide; ovules 8 to 10.

Adobe soil, especially banks of winter water courses, or depressions or landslips on hill slopes, or in sandy fields, 200 to 1500 feet: North Coast Ranges from Mendocino Co. south to coastal Southern California; Great Valley. Feb.-May.

Locs.—Coast Ranges: Ukiah, *Purdy;* Lagoon Pass, Solano Co., *Jepson* 8222; Martinez, *Brewer* 996; North Berkeley, *Jepson* 66t; Portola, San Mateo Co., *Elmer* 5021; Livermore, *Heller* 7320; Loma Prieta, *Davy* 631; San Luis Valley, *Summers.* S. Cal.: Santa Barbara, *Elmer* 4142; Ojai Valley, *Hubby;* Los Angeles, *Braunton* 880; San Bernardino, *Parish;* Hemet, *C. F. Baker* 4189; La Jolla, San Diego Co., *Jepson* 11,892. Great Valley: Anderson (Bull. Torr. Club 49: 202); College City, *Alice King;* Chico (Bull. Torr. Club 49:201); Yuba City, *Jepson;* Huron (Bull. Torr. Club 49:201).

Refs.—LUPINUS SUCCULENTUS Dougl.; C. Koch, Wochenschr. Gaertn. Pflanzenkunde 4:277 (1861), type cult., undoubtedly from Cal.; Jepson, Man. 521, fig. 518 (1925). *L. affinis* B. & W. Bot. Cal. 1:122 (1876); Jepson, Fl. W. Mid. Cal. 317 (1901), ed. 2, 218 (1911); not L. affinis Agardh (1835). *L. succulentus* var. *layneae* C. P. Sm. Bull. Torr. Club 49:203 (1922), type loc. Farallon City, San Mateo Co., *K. Brandegee;* low form; racemes short (not exceeding foliage).

37. **L. concinnus** Agardh. BAJADA LUPINE. Stems several from the base, stoutish, decumbent or ascending, 4 to 9 inches high; herbage densely villous or sometimes white-villous, tawny or rusty in age; leaves many, crowded; leaflets 5 to 8, oblanceolate, 4 to 10 lines long, obtuse or acute, the slender petioles ½ to 2 inches long; racemes short, rather dense, often nearly sessile, 1 to 2½ inches long, shorter than or little surpassing the leaves; bracts linear-setaceous, persistent; pedicels ½ to ¾ line long; flowers 3½ to 4½ lines long; upper calyx-lip 2-parted, the lower rather deeply 3-toothed; petals lilac (edged with reddish purple) or violet; banner with a yellow spot in center; keel nearly straight, the acumen thick, blunt; pods 4-seeded, villous; seeds angled or quadrangular.

Sandy valleys or washes, 50 to 5400 feet: Monterey Co. to San Diego Co., east to Inyo Co. and the Mohave and Colorado deserts. Far east to southern Utah and New Mexico, south to Lower California. Apr.-June.

Locs.—Los Burros Mine, Santa Lucia Mts. (Bull. Torr. Club 48:224); Estrella, *Jared;* Bakersfield, *Davy* 1800; Randsburg, *Heller* 7679; Panamint Range, *Hall & Chandler* 6955; Barnwell, e. Mohave Desert, *K. Brandegee;* Ord Mt., s. of Daggett, *Jepson* 15,508; Cajon Pass, *Jepson* 6113, *Peirson* 371; Lake Arrowhead, San Bernardino Mts., *Braunton* 1064; Chalk Hill, Mt. San Jacinto, *Jepson* 1297; Devils Cañon, near Coachella, *Clary* 8; San Felipe Creek, e. San Diego Co., *Jepson* 8783; Vallecito, e. San Diego Co., *Jepson* 8542.

Note on the varieties.—The named varieties, in our judgment, represent a continuous series rather than sharply differentiated groups. Var. OPTATUS C. P. Sm. has slightly larger flowers, var. ORCUTTII C. P. Sm. slightly smaller ones than the prevailing or typical form. Var. PALLIDUS C. P. Sm. and var. DESERTORUM C. P. Sm. rest upon uncertain leaf and pubescence characters. Var. AGARDHIANUS C. P. Sm., with more open habit and less dense pubescence, is usually recognizable:

Estrella, San Luis Obispo Co., *Jared;* Alamo Creek, Santa Barbara Co., *Cox;* La Jolla, San Diego Co., *Jepson* 11,876. It often resembles L. sparsiflorus Benth.

Refs.—LUPINUS CONCINNUS Agardh, Syn. Gen. Lup. 6, pl. 1, fig. 1 (1835), type from Cal., *Douglas* (cf. C. P. Sm. Bull. Torr. Club 48:221); Jepson, Man. 523 (1925). Var. ORCUTTII C. P. Sm. Bull. Torr. Club 48:225 (1921); Jepson, Man. 523 (1925). *L. orcuttii* Wats. Proc. Am. Acad. 20:359 (1885), type loc. Japa, L. Cal., *Orcutt. L. micensis* Jones, Proc. Cal. Acad. ser. 2, 5:630 (1895), type loc. Mica Spr., Nev., *Jones* 5064o. Var. OPTATUS C. P. Sm. l.c. 227, type loc. Grass Valley, San Bernardino Mts., *Parish* 3055; Jepson, Man. 523 (1925). Var. AGARDHIANUS C. P. Sm. l.c. 228; Jepson, Man. 523 (1925). *L. agardhianus* Hel. Muhl. 7:13 (1911). *L. gracilis* Agardh, Syn. Gen. Lup. 15, pl. 1, fig. 2 (1835). Var. PALLIDUS C. P. Sm. l.c. 229; Jepson, Man. l.c. *L. pallidus* Bdg. Zoe 4:203 (1893), type loc. Mission of San Vicente, n. L. Cal., *T. Brandegee.* Var. DESERTORUM C. P. Sm. l.c. 230; Jepson, Man. l.c. *L. desertorum* Hel. Muhl. 2:72 (1905), type loc. Randsburg, Kern Co., *Heller* 7679.

38. **L. hirsutissimus** Benth. STINGING LUPINE. (Fig. 188.) Plants robust, erect, 1 to 4 feet high, the stems hollow, branching above the middle or at the base; herbage markedly hispid-bristly with long nettle-like hairs; leaflets 5 to 8, cuneate-obovate, obtuse and mucronate, or truncate, ¾ to 2¼ inches long; racemes with scattered flowers, ½ to 1½ feet long; flowers 6½ to 7½ lines long; upper calyx-lip 2-cleft to about the middle into lanceolate acuminate lobes, lower lip slender-elongate, entire; petals blue; banner suborbicular; keel glabrous on upper margin, ciliate on the free edges of the lower margin; pods very hispid-bristly, ¾ to 1¼ inches long.

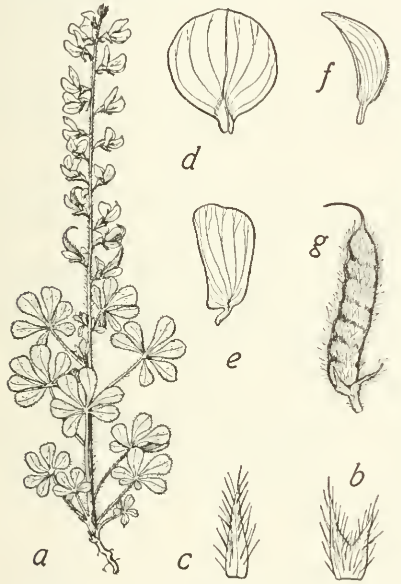

Fig. 188. LUPINUS HIRSUTISSIMUS Benth. *a*, habit, × ¼; *b*, upper lip of calyx, × 1⅓; *c*, lower lip of calyx, × 1⅓; *d*, banner, × 1; *e*, wing, × 1; *f*, keel, × 1; *g*, pod, × ⅔.

Openly wooded slopes in the hills, 100 to 1600 feet: Santa Cruz Co. to San Diego Co. South to Lower California. Mar.-May.

Locs.—Santa Cruz, *Anderson;* Hollister, *A. H. Kemp;* Fremont Peak, Gabilan Range, *Elmer* 4732; San Luis Mt., San Luis Obispo, *Summers;* Santa Susana Pass, *Jepson* 11,900; Rubio Cañon (foothills east of), San Gabriel Mts., *Peirson* 86; San Bernardino, *Parish;* Santa Catalina Isl. (Erythea 7:144); Santa Ana, *Alice King;* Mesa Grande, San Diego Co., *E. Ferguson* 11.

Refs.—LUPINUS HIRSUTISSIMUS Benth. Trans. Hort. Soc. ser. 2, 1:411 (1835), type cult. in England, the seeds from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. ed. 2, 219 (1911), Man. 523 (1925).

L. CLEMENTINUS Greene, Lflts. 2:85 (1910), type loc. San Clemente Isl., *Blanche Trask.* Two feet high; roughly hirsute; leaflets cuneate-oblong, ¾ inch long; racemes short, subsessile, the flowers scattered; corolla 7 lines long; keel naked, falciform (ex char.). Extremely dubious as to relationship.

39. **L. truncatus** Nutt. WOOD LUPINE. Stem stout and simple or slender and sparingly branched, 1 to 2 feet high; herbage finely pubescent, becoming nearly glabrous; leaflets 5 to 7, linear or linear-oblanceolate, truncate or 2 or 3-toothed at apex, glabrous above, ¾ to 1½ inches long, nearly equaling the petiole; petioles usually flattened; racemes lax, few to many-flowered; bracts short, subpersistent; pedicels 1 to 1½ lines long; flowers 4 to 5 lines long; calyx saccate at base on the upper side, the upper lip 2-cleft, much shorter than the entire or slightly 3-toothed lower one; corolla violet or deep purple; keel densely ciliate on its upper margin from the base to the lower part of the acumen; pod 1 to 1¼ inches long, 7 to 10-seeded.

Open woods or thickets, 20 to 3300 feet: coastal region from Monterey Co. to San Diego Co. South to Lower California. Apr.-May.

Locs.—Pacific Grove, *Tidestrom;* Berros, *Condit;* Arroyo Grande, *Alice King;* Santa Cruz Isl., *T. Brandegee;* Santa Catalina Isl., *K. Brandegee;* Claremont, *C. F. Baker* 4192; Arroyo Seco Cañon, San Gabriel Mts., *Peirson* 360; San Bernardino, *Parish;* Palomar Mt., *Jepson* 1532; Mt. Soledad near La Jolla, *Newlon* 289; Mesa Grande, San Diego Co., *E. Ferguson* 10.

Refs.—Lupinus truncatus Nutt.; H. & A. Bot. Beech. 336 (1840), type loc. San Diego, *Nuttall;* Jepson, Man. 523 (1925). Var. *burlewii* C. P. Sm. Bull. Torr. Club 47:505, fig. 61 (1920), type loc. Los Angeles, *F. E. Burlew.*

40. **L. benthamii** Hel. Spider Lupine. Stems 1 or several from the base, slender, rarely branched except at base, 1 to 2 feet high; herbage thinly hirsute, the stems and petioles also puberulent; stipules linear-setaceous; leaflets 7 to 10, narrowly linear or filiform, glabrous above, ¾ to 2 inches long, half as long as the very slender petioles; racemes 4 to 10 inches long; young tips of racemes conspicuously plumose by virtue of the villous bracts, these exceeding the buds, linear, 6 to 8 lines long, caducous; flowers 5 to 6½ lines long; calyx subsaccate or gibbous at base on upper side; lower lip narrow, 3-toothed at apex; upper lip deeply cleft into lanceolate lobes; petals 5 to 5½ lines long, bluish-lilac, the large yellow or white spot of the banner changing to deep crimson or purple; keel slender, glabrous on upper margin, slightly ciliate on lower margin near claw; pods ¾ to 1¼ inches long, 4 to 7-seeded, ¾ to 1¼ inches long.

Open hills and rocky slopes, often in very thin stands of oaks, 200 to 2500 feet: Sierra Nevada foothills from Placer Co. to Kern Co.; coastal region from Monterey Co. to northern Los Angeles Co. Apr.-June.

Foliage.—The leaflets are stellately disposed horizontally from the summit of the petioles. Being narrow and trough-like they have, extended so, a "spidery" effect not seen in other species. The leaflets are spaced almost equally around the circle; when a little unequal sometimes the gap is greater at the morphological base of the leaf-blade, sometimes it is greater elsewhere.

Locs.—Sierra Nevada foothills: Rattlesnake Bend, Placer Co., *Alice King;* Placerville, *K. Brandegee;* Pilot Hill, Eldorado Co., *Jepson* 15,764; Angels, Calaveras Co., *Davy* 1463; Clements, ne. San Joaquin Co., *Jepson* 15,196; Table Mt., Fresno Co., *Jepson* 15,128; North Fork, Madera Co., *Noddin;* Caliente, Kern Co., *K. Brandegee;* Rowen, Tehachapi Mts., *Jepson* 6720. Coastal region: Stony Creek, Santa Lucia Mts. (Bull. Torr. Club 47:506); Santa Maria, w. San Luis Obispo Co., *Ida Bloehman;* Elizabeth Lake, n. Los Angeles Co., *Davy* 2654.

Refs.—Lupinus benthamii Hel. Muhl. 2:61 (1905); Jepson, Man. 524 (1925). *L. leptophyllus* Benth. Trans. Hort. Soc. ser. 2, 1:411 (1835), type from Cal., *Douglas;* not L. leptophyllus C. & S. (1830). *L. benthamii* var. *opimus* C. P. Sm. Bull. Torr. Club 47:506, fig. 64 (1920), type loc. presumably in Madera Co., but near Pollasky (Fresno Co.), *Heller* 8136, refers to often stout individuals, usually with larger flowers, but without any constantly associated set of characters.

41. **L. sparsiflorus** Benth. Coulter Lupine. Plants 1 to 1½ (or 3) feet high, the stem sparingly or much branched; herbage puberulent and also with scattered stiff hairs; leaflets 5 to 9, oblong-oblanceolate to linear, 3 to 12 lines long, the shortly acute apex recurved, 4 to 12 lines long; petioles ½ to 2 inches long; racemes slender, dense, or sometimes lax, 2 to 9 inches long; flowers 4 to 6 lines long, spreading in anthesis, afterwards ascending; bracts linear-setaceous, shorter than the calyx, subpersistent; pedicels 1 to 1½ lines long; upper calyx-lip deeply 2-parted, the lower truncatish and apiculate or 3-toothed; petals violet or lilac; center of banner dull white, changing to a bright red-purple; keel glabrous or ciliate on upper side, usually ciliate toward the base on the lower side, its point slender, upturned at right angles; pods 5 to 6 lines long, 4 to 6-seeded.

Grassy clay hills or sandy valleys, 50 to 2000 feet: Ventura Co. to San Diego Co. East to southern Nevada and Arizona, south to Lower California. Apr.-May.

Locs.—Ojai Valley, *Hubby;* Antelope Valley, *Davy* 2323; Elysian Hills, Los Angeles, *Braunton* 816; Rubio Cañon, Pasadena, *Peirson* 87; Claremont, *C. F. Baker* 4103; San Bernardino foothills, *Parish;* Riverside, *C. M. Wilder;* San Jacinto, *Gregory;* Silverado Cañon, Santa Ana Mts., *Munz* 3717; Pauma Wash, near Palomar, *Jepson* 8490; Witch Creek, San Diego Co., *Alderson;* Box Cañon, Mason Valley, *Jepson* 8667.

Note on variation.—The described varieties have been furnished with a key by C. P. Smith (Bull. Torr. Club 47:494) based upon a few obvious characters but free use of the key often assembles unlike things in the varieties. The varieties are much disturbed by cross-currents, the association of characters in specimens as frequently differing as agreeing with the descriptions. The var. arizonicus C. P. Sm. has smaller flowers but is apparently not otherwise differentiated (Needles, *Jones*). The var. pondii C. P. Sm. is described as having leaflets truncate, rounded or emarginate at apex and as having compact racemes, but authentically named specimens may have lax instead of compact racemes (Tia Juana, L. Cal., *Orcutt*), or have flowers within the size limits of var. arizonicus (Coyote Cañon, Colorado Desert, *Hall* 2821). When too near the species, var. pondii becomes var. inopinatus C. P. Sm. with leaflets of var. pondii and flowers either the size of those of the species or of var. arizonicus. The differences in the shape of the banner of var. pondii and var. inopinatus as indicated by the figures (Bull. Torr. Club 47:500–501) do not hold constant, authentically named specimens showing that either form may have the banner distinctly clawed or distinctly not clawed. It is well stated by C. P. Smith (l.c. 47:492) that none of the varieties can be segregated upon the basis of pubescence, each showing the whole range of variations from densely villous to glabrate. We find, too, geographic segregation unsatisfactory. The two following varieties are less indistinct.

Var. **barbatulus** Thornber. Stems stout, hollow, more erect; leaflets broadly oblanceolate, 10 to 20 lines long, 3 to 6 lines wide; racemes usually 6 to 12 inches long; bracts sometimes equaling the calyx.—Needles, *Parish* 9617; Cottonwood Spr., Cottonwood Mts., *Jepson* 12,553; Whitewater, *Jepson* 11,638; San Felipe Narrows, e. San Diego Co., *Jepson* 8793, 12,527.

Var. **brevior** Jepson var. n. Diffuse, 3 to 9 inches high; leaflets truncatish or obtuse; racemes nearly sessile, not exceeding the foliage, ½ to 2 inches long; flowers 3 to 4 lines long.—(Ramosi diffusi, unc. 3–9 alti; foliola subtruncata vel obtusa; racemi subsessiles, unc. ½–2 longi, folia non superantes.)—Desert sands, in washes, western Colorado Desert: Myers Creek bridge, foot of Mountain Sprs. grade, *Jepson* 11,771 (type); Sentenac Valley (e. of San Felipe Valley), *Jepson* 8782; Wagon Wash near Sentenac Cañon, *Jepson* 12,506. The racemes and flowers are both shorter than in the species.

Refs.—LUPINUS SPARSIFLORUS Benth. Pl. Hartw. 303 (1848), type collected by Coulter, doubtless in Southern California; Jepson, Man. 524 (1925). *L. concinnus* var. *arizonicus* Wats. Proc. Am. Acad. 8:537 (1873), type loc. se. Cal. and w. Ariz. *L. arizonicus* Wats. l.c. 12:250 (1877). *L. sparsiflorus* var. *arizonicus* C. P. Sm. Bull. Torr. Club 47:495 (1920); Jepson, Man. l.c. *L. sparsiflorus* var. *pondii* C. P. Sm. l.c. 501; Jepson, Man. l.c. *L. pondii* Greene, Pitt. 1:288 (1889), type loc. Bay of San Bartolomé, L. Cal., *Pond;* Jepson, Man. l.c. *L. subhirsutus* Dav. Bull. S. Cal. Acad. 18:80 (1919), type loc. Palm Sprs., Colorado Desert, *Daggett*. Var. BARBATULUS Thornber; C. P. Sm. l.c. 497, type loc. valley of the Colorado River, *E. Palmer* 88; Jepson, Man. l.c. *L. sparsiflorus* var. *inopinatus* C. P. Sm. l.c. 499, type loc. San Diego, *T. Brandegee* (Baker's dist. no. 3411); Jepson, Man. l.c. Var. BREVIOR Jepson.

42. **L. citrinus** Kell. GOLD LUPINE. Plants diffusely branched from the base, 4 to 7 inches high; herbage white-villous; leaves a little crowded, the leaflets rather densely pubescent; leaflets 6 to 8, oblanceolate, obtuse, 5 to 12 lines long, shorter than the petioles; racemes 1 to 2 inches long, only slightly exceeding the foliage, the flowers not in whorls; flowers 4 to 4½ lines long, soon deflexing; upper and lower calyx-lips about equal, the upper deeply cleft, the lower minutely 2 or 3-toothed; corolla bright orange; keel glabrous above, ciliate below near claw; pods 5½ lines long, 1½ to 2 lines wide, glabrate, 2 to 4-seeded, pendulous on strongly reflexed pedicels; seeds quadratish, grayish, mottled with black.

Rocky hills, 4000 to 5300 feet: Fresno Co. Apr.-June.

Locs.—Pine Ridge; Toll House hill above Grapevine Spr., Fresno Co., *Congdon*.

Var. **deflexus** Jepson comb. n. About 1¼ feet high, a little less hairy; corolla white; pods 6 to 7 lines long, 1½ lines wide.—Mariposa Co. foothills: Mariposa Creek, *Congdon;* Pea Ridge road, *Congdon*.

Refs.—LUPINUS CITRINUS Kell. Proc. Cal. Acad. 7:93 (1877), type loc. not stated but actually mts. of Fresno Co., the area where Eisen collected in the seventies; Jepson, Man. 524 (1925). Var. DEFLEXUS Jepson. *L. deflexus* Congdon, Muhl. 1:38 (1904), type loc. Mariposa Creek, *Congdon;* Jepson, Man. l.c.

43. **L. stiversii** Kell. ROSE-AND-YELLOW LUPINE. (Fig. 189.) Stem diffusely branched (as if sympodially) from or near the base, 7 to 13 inches high; herbage finely and rather sparingly pubescent; leaflets 5 to 7, broadly cuneate-obovate, obtuse or acutish, mucronate, ½ to 1½ inches long, shorter than the petioles; racemes ¾ to 3 inches long, rather densely few to many-flowered, rather long-peduncled; bracts short; pedicels 1 to 2 lines long; flowers 6 to 7 lines long; upper calyx-lip 2-parted with broad acute lobes, lower lip entire or minutely 3-toothed; banner

bright yellow, shorter than the rose-pink wings; keel glabrous; anthers clay-yellow; pods ¾ to 1 inch long, nearly glabrous; ovules 5 to 7; seeds flat, angled, dark-spotted.

Sandy or gravelly soils, 1600 to 4300 feet: higher foothills of the Sierra Nevada from Butte Co. to Kern Co.; Santa Lucia Mts.; San Bernardino Mts. June-July.

Locs.—Brush Creek, Butte Co., *Conger;* Emigrant Gap to Bowman Lake, *L. S. Smith* 1605; Rattlesnake Bend, Placer Co., *Alice King;* Italian Bar, *Jepson* 6360; Five-mile Creek, South Fork Stanislaus River, *A. L. Grant* 733; Middle Strawberry dam, Tuolumne Co., *Elizabeth Perry;* Cherry River, Tuolumne Co., *A. L. Grant* 1230; Hodgdon Ranch, Tuolumne Big Trees, *Jepson* 10,543; Bowers Cave, Mariposa Co., *Jepson* 13,642; Wawona, *Jepson* 4299; Hogan Creek, Mariposa Co., *Jepson* 12,816; Lower Hot Sprs., South Fork San Joaquin River, *E. Ferguson* 401; North Fork, Madera Co., *Noddin;* betw. Dunlap and Millwood, *Jepson* 2766; Sunset Rock, Giant Forest, *Hopping;* Greenhorn Mts. (Bull. Torr. Club 48:220). Santa Lucia Mts.: Little Sur, *Davy* 7393. San Bernardino Mts.: Grass Valley, *Parish* 3111.

Refs.—Lupinus stiversii Kell. Proc. Cal. Acad. 2:192 (1863), type loc. Summit Mdws., Mariposa trail to Yosemite, *Charles H. Stivers;* Jepson, Man. 524 (1925).

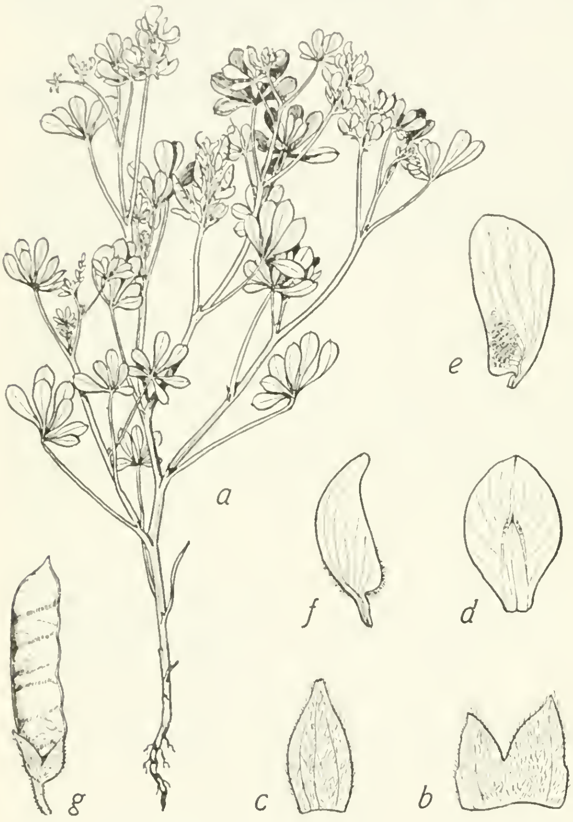

Fig. 189. Lupinus stiversii Kell. *a*, habit, × ⅙; *b*, upper lip of calyx, × 2; *c*, lower lip of calyx, × 2; *d*, banner, × 1½; *e*, wing, × 1½; *f*, keel, × 1½; *g*, pod, × 1.

44. **L. microcarpus** Sims. Chick Lupine. Plant commonly ½ to 2 feet high, the stem stout, often fistulous, sometimes succulent, simple below and parted at the middle into many spreading branches or sometimes branched from the base; herbage more or less villous; leaflets oblanceolate to oblong-oblanceolate, acute or rounded at apex, often mucronate, ½ to 1½ inches long; racemes 4 to 10 inches long, on long or short peduncles; whorls very definite and rather remote, sometimes approximate; bracts setaceous, commonly shorter than the calyx, reflexing; pedicels ½ to 1 line long; flowers 4 to 7 lines long, spreading, after anthesis becoming closely erect; calyx sparingly pubescent, the upper lip scarious, obscurely toothed or cleft, the lower long, toothed; petals rose-pink or lilac to dark purple; keel ciliate near the claw on upper margin, sometimes also on lower margin; pods ovate to oblong-ovate, 6 to 8 lines long, long-hairy; seeds 2, usually minutely granulose.

Valley flats or hillsides, 5 to 2500 feet: Monterey Co. to Siskiyou Co., thence east to Lassen and Modoc Cos. North to southern and eastern Oregon. Apr.-May.

The original material of Lupinus microcarpus Sims came from Chile. While Chilean collections of this species are scanty in North American herbaria, the material before us resembles Californian specimens very closely. In certain cases, if the labels were removed, it would seem impossible, on the basis of the material itself, to say whether a given sheet were Californian or

Chilean. Well developed about San Francisco Bay, outside this region the plants are often reduced in stature, sometimes with increased foliage pubescence, the racemes sometimes with fewer whorls, the flowers sometimes smaller. Such widely distributed forms, imperfectly distinguishable, have been described as Lupinus subvexus var. phoeniceus C. P. Sm. (Mt. Hamilton Range), var. albilanatus C. P. Sm. (San Luis Obispo Co.), var. transmontanus C. P. Sm. (Lassen Co., Modoc Co., w. Siskiyou Co.), var. insularis C. P. Sm. (Santa Cruz Isl.). These varieties, as well as those segregated from L. densiflorus Benth. by C. P. Smith, do not, on the whole, show geographic consistence. The following we have named as representing the species.

Locs.—Antioch, *Davy;* Mt. Diablo, *Jepson* 9214; Richmond, *K. Brandegee;* San Francisco, *Tidestrom;* Livermore Pass, *Davy;* Pacheco Pass, *Jepson* 12,740; upper Waltham Creek, w. Fresno Co., *Jepson* 16,164; Palo Prieto Pass, e. San Luis Obispo Co., *Jepson* 16,199; Carrizo Plain, e. San Luis Obispo Co., *Jepson* 12,014; O'Neil ranch, Orange Co., *Malmsten.*

Var. **densiflorus** Jepson comb. n. GULLY LUPINE. (Fig. 190.) Flowers spreading, becoming secund after anthesis with the bending over of the raceme; petals white, yellow, or sometimes purple or rose-color.—Banks of gullies, hillslopes, landslips, 50 to 2500 feet: widely distributed in cismontane California. Apr.-May.

This variety is on the whole extremely uniform in aspect, in habit, in foliage, essential character of trichomes, racemes, flowers and fruits. The following structural details are so variable within even a small group from the same locality, or in the same individual, that failing association with other more constant characters, they are of no value or little value in making segregates of this variety, namely: length and number of hairs and their direction; degree of succulence of stem; shape and toothing of calyx-lips or absence of toothing; color of corolla; shape or curvature of keel, and presence or absence of cilia on lower margin; shape of banner, whether gradually or abruptly contracted at base, or rounded or contracted at apex; presence or absence of cilia on upper basal angle of limb of wings. For example, we refer to the following forms, named by authors as varieties of L. densiflorus Benth.: the var. palustris C. P. Sm., with deep purple petals, occurs in low ground near the ocean from western Contra Costa Co. to Monterey (Richmond; Berkeley; Alameda; Watsonville, coast w. of, *C. F. Baker* 3009), but Richmond spms., authentically named, have corollas dark purple to white, with the lower calyx-lip from typically bifid to the extreme trifid condition assigned to var. stanfordianus C. P. Sm. Var. crinitus Eastw. is markedly villous and has 2 to 4 whorls to the racemes; it occurs near the ocean from Dillons Beach, Marin Co., to Bodega, Sonoma Co. Recent collections of more vigorous plants often show 7 whorls, instead of "2 to 4," which might, almost, have been predicted. Var. menziesii C. P. Sm., characterized by its fistulous stems, very often does not have fistulous stems, though the petals are commonly yellow (Venado, w. Colusa Co., *Jepson* 16,264; Pt. Isabel, Berkeley, *H. A. Walker* 108). The varieties macgregori and altus have smaller flowers, the former with straight, the latter with curved keel. Such keel differences are, however, of slight importance. In the var. glareosus C. P. Sm., the leaflets blacken in drying,

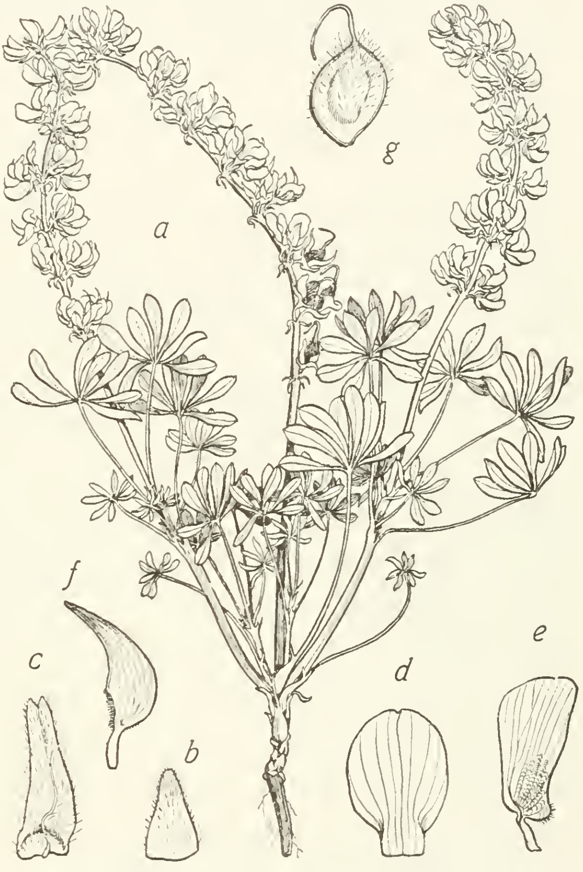

Fig. 190. LUPINUS MICROCARPUS Sims var. DENSIFLORUS Jepson. *a*, habit, × ⅓; *b*, upper lip of calyx, × 2; *c*, lower lip of calyx, × 2; *d*, banner, × 1½; *e*, wing, × 1½; *f*, keel, × 1½; *g*, pod, × 1.

the petals are blue and the banner has a white center.—Mt. Pinos; but blackening leaflets sometimes occur in a quite different strain of the Mendocino region. In the var. lacteus C. P. Sm., the petals are nearly white (Rowen, Tehachapi Mts., *Jepson* 6738; Tejon Pass, *Parish* 9256; Ojai Valley, *Hubby;* Santa Ana, *Alice King;* Coyote Cañon, Santa Rosa Mts.). The specimens cited below are regarded as typical of the var. densiflorus.

Locs.—Coast Ranges: Zem-zem, ne. Napa Co., *Jepson* 9049; Putah Creek near Winters, *E. Ferguson* 338; Weldon Cañon, Vaca Mts., *Jepson* 171; Pt. San Quentin, Marin Co., *Jepson* 9063; Livermore, *Jepson* 231; Mt. Hamilton, *Jepson* 8241; San Luis Obispo, *Brewer* 483; Zapato Cañon, sw. Fresno Co., *Jepson* 15,384. Sierra Nevada foothills: Michigan Bar, ne. Sacramento Co., *Jepson* 15,260; Chinese Camp, Tuolumne Co., *Jepson* 6315; Cathay Valley, Mariposa Co., *Jepson* 12,768. S. Cal.: Banning, *Jepson* 6086.

Var. **ruber** C. P. Sm. Flowers ascending in anthesis; petals dull red to pink; banner 1 to 2 lines wide.—Dry valleys and hillslopes: Inyo, Kern and San Luis Obispo Cos. to San Diego Co. South to Lower California.

Locs.—Argus Mts., *Purpus* 5437; Tehachapi, *K. Brandegee;* San Emigdio Cañon, *Davy* 2059; Huerhuero, San Luis Obispo Co., *Barber;* Estrella, *Jared;* Banner, San Diego Co., *T. Brandegee.*

Var. **horizontalis** Jepson comb. n. Flowers ascending or suberect (or sometimes spreading) in anthesis; petals lavender, changing to white; banner 2½ to 3 lines wide.—Sandy flats, upper San Joaquin Valley and Mohave Desert: Randsburg, *K. Brandegee;* Barstow, *Jepson* 5895.

Refs.—LUPINUS MICROCARPUS Sims, Bot. Mag. t. 2413 (1823), type loc. Chile. *L. subvexus* C. P. Sm. Bull. Torr. Club 44:405 (1917), type loc. Madison, Yolo Co., *Heller & Brown* 5415; Jepson, Man. 520 (1925). *L. subvexus* var. *nigrescens* C. P. Sm. l.c. 45:13 (1918), type loc. Griffins, Mt. Pinos, Ventura Co., *Elmer* 4006 (leaves blackening in drying, ex char.). *L. subvexus* var. *transmontanus* C. P. Sm. l.c. 15, type loc. Antelope, Wasco Co., Oregon, *T. Howell* (banner acute at apex, ex char.); Jepson, Man. 520 (1925). *L. subvexus* var. *insularis* C. P. Sm. l.c. 17, type loc. Santa Cruz Isl., *T. Brandegee. L. subvexus* var. *phoeniceus* C. P. Sm. l.c., type loc. Mt. Hamilton road, Santa Clara Co., *Heller* 8652; Jepson, Man. l.c. *L. subvexus* var. *albilanatus* C. P. Sm. l.c. 19, type loc. Paso Robles, San Luis Obispo Co., *K. Brandegee* (foliage with conspicuous short white pubescence; banner narrow, ex char.); Jepson, Man. 520 (1925). Var. DENSIFLORUS Jepson. *L. densiflorus* Benth. Trans. Hort. Soc. ser. 2, 1:410 (1835), type cult., the seeds from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. 318 (1901), ed. 2, 220 (1911), Man. 520 (1925). *L. densiflorus* var. *stenopetalus* C. P. Sm. Bull. Torr. Club, 45:174 (1918), type loc. Los Gatos, Santa Clara Co., *Heller* 7385. *L. densiflorus* var. *menziesii* C. P. Sm. l.c. 176; Jepson, Man. 521 (1925). *L. menziesii* Agardh, Syn. Gen. Lup. 2 (1835), type from Cal., *Douglas;* Jepson, Man. l.c. *L. menziesii* var. *aurea* Kell. Proc. Cal. Acad. 5:16 (1873), type loc. "Deer Valley near Antioch", *Kellogg & Brannan. L. densiflorus* var. *perfistulosus* C. P. Sm. l.c. 175, type loc. not given, *Kellogg & Harford* 187. *L. densiflorus* var. *tracyi* C. P. Sm. l.c. 179, type loc. Willow Creek, Trinity River Valley, *Tracy* 3280. *L. densiflorus* var. *latilabrus* C. P. Sm. l.c. 178, type loc. near Ione, Amador Co., *E. Braunton* 1081. *L. densiflorus* var. *glareosus* C. P. Sm. l.c. 180; Jepson, Man. l.c. *L. glareosus* Elmer, Bot. Gaz. 39:53 (1905), type loc. Griffins, Ventura Co., *Elmer* 3588. *L. densiflorus* var. *lacteus* C. P. Sm. l.c. 181; Jepson, Man. l.c. *L. lacteus* Kell., Proc. Cal. Acad. 5:37 (1873), type loc. Oak Creek, Kern Co., 14 mi. from Tejon Pass, *S. Brannan. L. arenicola* Hel. Muhl. 2:75 (1905), type loc. near Caliente, Kern Co., *Heller* 7609. *L. densiflorus* var. *sublanatus* C. P. Sm. Bull. Torr. Club 45:183 (1918), type loc. Water Cañon, Tehachapi Mts., *Abrams & McGregor* 485. *L. densiflorus* var. *macgregori* C. P. Sm. l.c. 184, type loc. Rock Creek, San Gabriel Mts., *Abrams & McGregor* 551. *L. densiflorus* var. *altus* C. P. Sm. l.c. 185, type loc. Manzana, Antelope Valley, Los Angeles Co., *Davy* 2505. *L. densiflorus* var. *vastiticola* C. P. Sm. l.c. 186, type loc. Mohave Desert, *Pringle. L. densiflorus* var. *versabilis* C. P. Sm. l.c. 187, type loc. Fresno, *Heller* 8174. *L. densiflorus* var. *latidens* C. P. Sm. l.c. 188, type loc. near San Bernardino, *Parish* 4165. *L. densiflorus* var. *dudleyi* C. P. Sm. l.c. 189, type loc. w. of San Mateo, *Dudley. L. densiflorus* var. *persecundus* C. P. Sm. l.c. 190, type loc. Duncan Mills, Sonoma Co., *Jones* 3329. *L. densiflorus* Benth.; Agardh, Syn. Gen. Lup. 3 (1835), type from Cal., *Douglas. L. densiflorus* var. *palustris* C. P. Sm. l.c. 191. *L. palustris* Kell. Proc. Cal. Acad. 5:16 (1873), type loc. San Joaquin River, *Kellogg & Bloomer. L. microcarpus* Jepson, Fl. W. Mid. Cal. 319 (1901) in part, ed. 2, 220 (1911) in part. *L. densiflorus* var. *stanfordianus* C. P. Sm. Bull. Torr. Club 45:194 (1918), type loc. Stanford, Santa Clara Co., *C. P. Smith* 791. *L. densiflorus* var. *crinitus* Eastw.; C. P. Sm. l.c. 195, type loc. Bodega Pt., Sonoma Co., *Chandler* 686; Jepson, Man. l.c. *L. densiflorus* var. *curvicarinus* C. P. Sm. l.c. 196, type loc. Woodland, *Blankinship. L. densiflorus* var. *austrocollium* C. P. Sm. l.c. 200, type loc. near St. Mary's Hospital, San Diego, *Abrams* 3465; Jepson, Man. l.c. *L. densiflorus* var. *trichocalyx* C. P. Sm. l.c. 198, type from Cal., *Douglas* (ex herb. Lindl.). Var. RUBER C. P. Sm., Bull. Torr. Club 45:10, fig. 4 (1918); Jepson, Man. 520 (1925). *L. ruber* Hel. Muhl. 2:73 (1905), type loc. Tehachapi, *Heller* 7827. Var. HORIZONTALIS Jepson. *L. horizontalis* Hel. Muhl. 2:74 (1905), type loc. Sunset, Kern Co., *Heller* 7725; Jepson, Man. 520 (1925). *L. horizontalis* var. *platypetalus* C. P. Sm. Bull. Torr. Club 45:12, fig. 6 (1918), type loc. e. base Fremont Peak, Mohave Desert, *Hall & Chandler* 6860; Jepson, Man. l.c.

45. **L. luteolus** Kell. Butter Lupine. Stem 1 to 2 feet high, branched above; herbage pubescent or puberulent, the stems glabrous below; leaflets usually 7, (½ or) ¾ to 1¼ inches long; racemes crowded, 2 to 9 inches long, the whorls definite; flowers 6 to 7 lines long; calyx-tube subsaccate beneath the upper lip; upper lip entire or bifid, ½ length of the lower lip; lower lip lanceolate, entire or toothed; petals light yellow; banner ovate; wings ciliate near the claw; keel densely ciliate on both margins; pods hirsute, 2-seeded.

Moist banks, dry adobe slopes or gravelly washes, 500 to 4000 feet: inner or middle Coast Ranges (inside the Redwood belt) from San Benito Co. to Mendocino and Siskiyou Cos.; also outside the Redwood belt at Cape Mendocino. North to southern Oregon. June-July.

Habit note.—The plant, commonly 1½ to 2 feet tall, is typically widely branching, with horizontally spreading branches bearing erect racemes. The raceme terminating the main axis flowers first and goes on early into the fruiting stage, the racemes on the lateral branches next flowering in succession outward. The plants become, thus, 2 to 3 feet broad. Colonies with yellow flowers sometimes show variations to white and to light blue (betw. Houghs Sprs. and Bartlett Sprs., *K. Brandegee*). The leaflets are often glabrous above in northern plants (Humboldt and Siskiyou Cos.).

Locs.—Upper San Benito River, *Inez Ray Smith* 715; Walnut Creek, *Maynard;* Kelseyville, *Jepson* 13,641; Mt. Sanhedrin, *Purpus* 1132; Cahto, Mendocino Co., *Eastwood;* Rancheria Creek, Mendocino Co., *Bolander* 6512; Capetown, Humboldt Co., *Jepson* 2142; Buck Mt., Humboldt Co., *Tracy* 2696; Kneeland Prairie, Humboldt Co., *Tracy* 3871; Middle Creek sta., Shasta Co., *Heller* 7951; Yreka, *Butler* 1447, 910.

Refs.—Lupinus luteolus Kell. Proc. Cal. Acad. 5:38 (1873), type loc. "Senal" (probably Usal), Mendocino Co.; Jepson, Fl. W. Mid. Cal. 318 (1901), ed. 2, 219 (1911), Man. 521 (1925). *L. bridgesii* Gray; Wats., Proc. Am. Acad. 8:538 (1873), type, *Bridges* 55; type loc. stated as "Sacramento Valley", but doubtless Coast Ranges.

46. **L. shockleyi** Wats. Desert Lupine. Plants 2 to 5 inches high, the stems few to many from the base and very short; stems and petioles densely villous, the leaflets almost white-silky beneath (especially when young), above bright green and glabrous, except the very margins; leaflets 7 to 10, narrowly obovate, obtuse, 6 to 10 lines long; flowers not in whorls, the racemes shorter than the leaves, ½ to 1¾ inches long; flowers 1½ to 2 lines long; pedicels often curved, ½ as long as the flowers; calyx-lips subequal, the lower one minutely 3-toothed at apex, the upper 2-parted into lanceolate lobes; corolla dark purple, or rarely pink; banner ovate to obovate; pods broadly ovate, minutely and densely scaly on the sides, hairy on the margin, 6 to 7 (or 9) lines long; seeds flattish, clay-color, irregularly lineate or vermiform-wrinkled.

Sandy flats and washes, 500 to 4000 feet: west side of the Colorado Desert; Mohave Desert and its bordering foothills or mountains. East to Nevada and Arizona. Apr.-May.

Locs.—Borrego Sprs., *T. Brandegee;* Whitewater, *Jepson* 11,630; Hesperia, *Parish;* Barstow; Yermo sta., *K. Brandegee;* Tehachapi, *K. Brandegee;* Granite Wash, *Parish* 10,075; Kelso, *K. Brandegee.*

Refs.—Lupinus shockleyi Wats. Proc. Am. Acad. 22:470 (1887), type loc. "Mohave Desert, San Bernardino Co.", *Parish Bros.*, May, 1882; also near Soda Spr., Esmeralda Co., Nev., *Shockley;* Jepson, Man. 520 (1925).

47. **L. odoratus** Hel. Mohave Lupine. Stem very short or shortly branched (¼ to 1½ inches long), producing few to many ascending or erect peduncles and long-petioled leaves and thus forming a plant 4 to 12 inches high; herbage glabrous or sparsely villous; leaflets 7 to 9, obovate, attenuate at base, obtuse or subacute at apex, ¼ to 1 inch long; petioles 1½ to 4 inches long; peduncles mostly equaling or exceeding the leaves; racemes dense or loose, 2 to 6 inches long; flowers 4 to 5 lines long; pedicels 1 to 3 lines long; bracts persistent; upper calyx-lip about as broad as long, 1 line long, entire or notched; the lower about twice as long, entire or obscurely 3-toothed; petals blue or purple, the banner with a yellow center; keel a

little upcurved; pods oblong, 5 to 8 lines long, 3 to 4 lines wide, smooth or scaly on the sides, hirsute on the margins; ovules 2 to 6.

Sandy flats or valleys, 2000 to 4000 feet: Mohave Desert and north to Inyo Co. East to Nevada and Arizona. Apr.-June.

Field note.—A purple color, unusually rich, characterizes the petals of Lupinus odoratus. The spot on the banner may be either white or yellow; it is very sharply defined in either case, especially so when white. The flowers are not obviously fragrant. A desert adaptation is shown in the fleshy-thickened bases of the stems and petioles as water reservoirs.

Locs.—Antelope Valley, *Davy* 2223; Pallett Creek, n. slope San Gabriel Mts., *Peirson* 2477; Hesperia, *Parish* 3774; Mohave sta. (15 mi. e.), *Jepson* 15,438; Amargo, *Jepson* 15,779; Kramer, *Jepson* 5348; Ord Mt., *Jepson* 15,517; Barstow, *Mary Beal;* Calico Wash, *Jepson* 5818; Calico Mts., *Jepson* 5404; Randsburg; Big Pine, Inyo Co.; Bishop, Inyo Co., *Shockley* 424a.

Note on variations.—The variant Lupinus rubens Hel. is intermediate between L. pusillus Pursh and L. odoratus Hel.; it is very close to the variant L. flavoculatus Hel. This latter form has the calyx glabrous save that the lips are thinly hirsute; sometimes on the one plant occur also calyces with a few hairs on the calyx-tube as well as on the lips, which condition describes L. rubens Hel. We cite as var. FLAVOCULATUS Jepson comb. n.: South Fork Kern River, *Purpus* 5714; Barnwell, *K. Brandegee;* Wild Rose Spr., Panamint Range, *Parish* 10,259; Lone Pine, *K. Brandegee.* The first and last cited spms. simulate L. brevicaulis Wats. closely and doubtless have an intimate affinity. We cite as var. RUBENS Jepson comb. n. (herbage except upper surface of leaves hirsute and more or less pubescent; calyx-lips and -tube both hirsute): Devils Cañon, near Coachella, *Clary.* Var. PILOSELLUS C. P. Sm. is another one of these slight forms, with hairy herbage like L. pusillus, but the calyx hirsute only on the margin of the lips.—Mohave River, *Palmer* 84; Cima, *Jepson* 15,840.

Refs.—LUPINUS ODORATUS Hel. Muhl. 2:71 (1905), type loc. Kramer, San Bernardino Co., *Heller* 7673; C. P. Sm. Bull. Torr. Club 46:401, fig. 48 (1919); Jepson, Man. 519 (1925). Var. FLAVOCULATUS Jepson. *L. flavoculatus* Hel. Muhl. 5:149, pl. 5 (1909), type loc. Rhyolite, Nye Co., Nev., *Heller* 9669. *L. rubens* var. *flavoculatus* C. P. Sm. l.c. 46:404 (1919); Jepson, Man. l.c. Var. RUBENS Jepson. *L. rubens* Rydb. Bull. Torr. Club 34:45 (1907), type loc. s. Utah, *Parry* 41; Jepson, Man. 519 (1925). Var. PILOSELLUS C. P. Sm. l.c. 46:402 (1919), type loc. Nipton, San Bernardino Co., *K. Brandegee;* Jepson, Man. l.c.

48. **L. pusillus** Pursh. RUSTY LUPINE. Stem short (½ to 1½ inches), producing a terminal raceme and later several or many flowering branches from the lower axils, forming a congested or compact plant 3 to 5½ inches high; petioles and stems rusty-pilose; leaves surpassing the racemes; leaflets 5, glabrous above, 6 to 11 lines long; petioles ¾ to 1¾ inches long; racemes subsessile, dense to rather lax, 1 to 2½ inches long; flowers not whorled, 3 to 4 lines long; bracts persistent; calyx villous, the lower lip more than twice as long as the upper; petals bluish to whitish; keel nearly straight, non-ciliate; pods oblong, 6 to 8 lines long, 2-seeded.

Sandy plains or valleys, 4000 to 6000 feet: Inyo Co.; Modoc Co. Eastern Washington to Nevada, Arizona and Colorado. May-July.

Locs.—Deep Spring Valley, Inyo Co., *Purpus* 5807; Surprise Valley, e. Modoc Co. (Bull. Torr. Club 46:409).

Seeds.—The seeds of Lupinus pusillus are flattened, circular, with a somewhat cord-like margin and rugulose on the sides. The seeds of L. shockleyi Wats. of western Nevada are similar with some variation. L. odoratus has seeds similar to those of L. pusillus, but also exhibits angular unflattened seeds. Those of L. brevicaulis are thick-lenticular and highly polished.

Refs.—LUPINUS PUSILLUS Pursh, Fl. 468 (1814), type loc. "on the banks of the Missouri", *Lewis.* Var. *intermontanus* C. P. Sm. Bull. Torr. Club 46:408 (1919); Jepson, Man. 519 (1925). *L. intermontanus* Hel. Muhl. 8:87, pl. 12 (1912), type loc. Wadsworth, Churchill Co., Nev., *Heller* 9599.

49. **L. brevicaulis** Wats. SAND LUPINE. Plants 2 to 4 inches high, the stem short (or shortly branched), ¼ to ½ inch high, the crowded leaves and peduncles therefore basal or sub-basal; herbage villous, the leaflets glabrous above; leaflets 4 to 6 lines long; peduncles 1 to 2¼ inches long; racemes subcapitate, ½ to 1½ inches long, rather shorter than the leaves, or elongating after anthesis; flowers 2½ to 3½ lines long, crowded; pedicels villous, ½ to 1 line long; calyx villous; lower calyx-lip entire or slightly toothed, 1½ to 2 lines long, the upper lip very short or almost obsolete (⅕ to ¼ as long as the lower), membranous, truncate,

bifid; petals bright blue or pale; keel straight or nearly so; pods ovate, thinly hirsute, 3½ to 5 lines long; ovules 2 or 3; seeds 1 line long.

Desert sands, 4000 to 5000 feet: eastern Mohave Desert; Inyo Co. Nevada and Oregon to Colorado and New Mexico and Chihuahua. May-June.

Locs.—Cima sta., e. San Bernardino Co., *K. Brandegee;* Bishop, Inyo Co., *Shockley* 424.

Refs.—LUPINUS BREVICAULIS Wats. Bot. King 53, pl. 7, figs. 1–4 (1871), type loc. "western Nevada to East Humboldt Mts.", *Watson;* Jepson, Man. 520 (1925). *L. uncialis* Wats. l.c. 54, pl. 7, figs. 5–10, type loc. Truckee and Pah-Ute ranges, w. Nev., *Watson. L. dispersus* Hel. Muhl. 5:141, pl. 3, figs. 13–18 (1909), type loc. Rhyolite, Nev., *Heller* 9643. *L. scaposus* Rydb. Bull. Torr. Club 34:45 (1907), type loc. Glenwood Sprs., Colo., *Osterhout.*

12. CYTISUS L.

Shrubs. Leaves 1 to 3-foliolate. Flowers yellow or white. Calyx-tube campanulate, its limb (in ours) 2-lipped. Petals broad; keel obtuse. Stamens monadelphous. Pod flattened, several-seeded.—Species 50, Europe, Asia, northern Africa. (Greek kutisus, a kind of clover.)

Branches leafless or mostly so; pods hairy only along the margins	1. *C. scoparius.*
Branches very leafy; pods hairy all over	2. *C. monspessulanus.*

1. **C. scoparius** Link. SCOTCH BROOM. Shrub 3 to 6 feet high, with angular broom-like leafless branches or sparingly leafy; primary leaves of the vegetative shoots mostly simple, the remaining ones palmate; leaves or leaflets 2 to 6 lines long; flowers solitary or in pairs in the axils, 10 lines long; upper calyx-lip entire, lower minutely 3-toothed; corolla bright yellow; pods pilose along the margins, blue-black in age.

Grassy hills, 50 to 200 feet, naturalized from Europe: along the coast from San Mateo Co. to Del Norte Co.; Sierra Nevada foothills from Eldorado Co. to Nevada Co. Dec.-May.

Locs.—Coast Ranges: Millbrae, San Mateo Co., *Jepson* 9534; Mission Hills, San Francisco, acc. *Elsie Zeile;* Bear Valley, Marin Co., *Jepson* 8294; Sebastopol, *G. G. Frey;* Occidental, Sonoma Co., *M. S. Baker;* upper Adobe Creek, Kelseyville, acc. *Blankinship;* Mendocino City, *Davy & Blasdale* 6100; Ft. Bragg, *W. C. Mathews* 100; Petrolia, Humboldt Co., *Tracy* 6289; Smith River, Del Norte Co., *Goddard* 345. Sierra Nevada: Nevada City, *Jepson* 16,765.

Refs.—CYTISUS SCOPARIUS Link, Enum. Hort. Berol. 2:241 (1822); Jepson, Man. 533 (1925). *Spartium scoparium* L. Sp. Pl. 709 (1753), type from Europe.

2. **C. monspessulanus** L. FRENCH BROOM. Shrub 5 to 9 feet high; branchlets villous; leaflets obovate, mucronulate, glabrous or subglabrous above, pubescent beneath, 4 to 8 lines long; racemes very short or capitate, 3 to 9-flowered, leafy at base; upper calyx-lip deeply 2-lobed, the lower minutely 3-toothed; flowers fragrant, 5 lines long; corolla bright yellow; pods densely villous, 10 to 12 lines long.

Cultivated shrub, native of Europe, near the coast occurring as a garden escape or sometimes definitely naturalized.

Locs.—Palo Colorado, near Big Sur River, Monterey Co., *Parish* 20,046; Ben Lomond, Santa Cruz Mts., *Jepson* 16,907; Calistoga, *Jepson* 9972; Dyerville, Eel River, *Jepson* 16,435; Eureka, *Tracy* 2413.

Refs.—CYTISUS MONSPESSULANUS L. Sp. Pl. 740 (1753), type loc. Montpellier, France: Bailey, Stand. Cycl. Hort. 2:948 (1914). *C. canariensis* of some Cal. collectors.

13. ULEX L.

Densely spiny shrubs with dark green almost leafless branches. Leaves reduced to spines or small scales. Flowers yellow, showy, axillary and often crowded at the ends of the branches. Calyx yellow, deeply 2-lipped. Stamens monadelphous.—Species 20, western Europe and northern Africa. (Old Latin name of some similar plant.)

1. **U. europaeus** L. FURZE. GORSE. Two to 4 feet high; pods villous, ½ inch long.

Naturalized from Europe, near the coast, 5 to 500 feet: Marin Co. to Humboldt Co. May-Nov.

Locs.—San Rafael, acc. *M. C. Richter;* Bodega, *Chandler* 685; Eureka, *Tracy* 6594.

Refs.—ULEX EUROPAEUS L. Sp. Pl. 741 (1753), type from Europe; Jepson, Man 533 (1925).

14. **MEDICAGO** L. MEDICK

Herbs, the leaves and flowers essentially as in Melilotus. Flowers in short racemes, spikes or loose heads. Stamens diadelphous, the upper one entirely free. Pod small, 1 to several-seeded, incurved or coiled or spirally twisted, indehiscent.—Species 50, Europe, Asia and Africa. (Greek Medike, name given by Dioscorides to a plant from Media, perhaps lucern, that is, Medicago sativa.)

Perennial; flowers blue..........1. *M. sativa.*
Annuals; flowers yellow.
Pod 1-seeded, reniform, unarmed but strongly nerved..........2. *M. lupulina.*
Pod several-seeded, spirally coiled,
Margined with prickles.
Edge of the pod keeled, not grooved between the prickles; leaflets not splotched. 3. *M. hispida.*
Edge of the pod furrowed between the prickles; leaflets with a large inky splotch on the upper face..........4. *M. arabica.*
Unarmed..........5. *M. apiculata.*

1. **M. sativa** L. ALFALFA. Perennial from an elongated taproot, erect and smooth; leaflets oblong-obovate or linear-oblong, 8 to 10 lines long; flowers blue-purple (5 lines long), in racemes; pods spirally twisted so as to form 2 or 3 complete rings or coils.

Cultivated Asiatic plant, occasional as an escape in low or moist valleys or river bottoms, 10 to 2000 (or 6500) feet: widely distributed but rarely truly spontaneous, almost always near or in cultivated fields. As was long ago said (Davidson, Erythea 1:58), it is doubtful if the plant would survive in California if cultivation of it ceased. May-Oct.

A native of western Asia, Medicago sativa has been cultivated for more than twenty centuries. It was introduced into California in 1854 and is called with us the "king of forage plants", since it gives, under the best conditions of soil and irrigation, three to seven crops per year which produce a total of four to ten tons of hay per acre. It is also valued as a bee plant and yields 10 to 30 or sometimes even 60 pounds of honey to the acre in a season. The plant is rarely called Lucern.

Locs.—San Diego Co. (Orcutt, Fl. S. & L. Cal. check-list, 5); Santa Catalina Isl. (Erythea 7:144); Los Angeles, *E. D. Palmer;* Silver Cañon, White Mts., *Jepson;* Rosedale, Kern Co., *Davy;* Los Altos, Santa Clara Co., *Dutton;* Mt. Eden, w. Alameda Co., *Jepson* 9721; Alameda marshes, *Davy;* Antioch, *Jepson;* Brentwood, *Jepson;* betw. Old River bridge and Stockton, *Jepson;* Norman, Glenn Co., *Davy;* Van Duzen River valley near Buck Mt., *Tracy* 2857.

Refs.—MEDICAGO SATIVA L. Sp. Pl. 778 (1753), type European; Jepson, Fl. W. Mid. Cal. 313 (1901), ed. 2, 220 (1911), Man. 533 (1925).

2. **M. lupulina.** L. NONESUCH. BLACK MEDICK. Branching from the base into spreading procumbent stems 9 to 18 inches long; leaflets orbicular and more or less deltoid to cuneate-obovate, 4 to 6 lines long; peduncles longer than the leaves (1 to 1½ inches long), bearing a short dense spike of bright yellow flowers; pods reniform, 1-seeded, black when ripe.

Naturalized from Europe, valleys and hills, 10 to 6000 feet: not common but widely distributed. Apr.-June.

Locs.—San Diego Co. (Orcutt, Fl. S. & L. Cal. check-list 4); San Bernardino Valley, *Parish* 11,999; Swartout Valley, San Gabriel Mts., *Peirson* 3191; Pleasant Cañon, Panamint Range; New Almaden, Santa Clara Co., *Davy* 382; San Francisco (Erythea 6:65); Berkeley, *J. Allen DeCou;* Murphys Camp (Erythea 6:18); Jackson (Hansen, Fl. Sequoia Reg. 1); Elk Grove, Sacramento Co., *M. C. Richter;* Cascade, Lake Tahoe, *Chesnut & Drew;* Ft. Bragg, *W. C. Mathews* 92; Scotia, Humboldt Co., *Davy* 5532; Klamath River, *Chandler* 1423; Yreka, *Butler* 1039; Crescent City, *Davy* 5928.

Refs.—MEDICAGO LUPULINA L. Sp. Pl. 779 (1753), type European; Jepson, Fl. W. Mid. Cal. 313 (1901), ed. 2, 220 (1911), Man. 534 (1925).

3. **M. hispida** Gaertn. BUR CLOVER. Branches spreading or procumbent, from a few inches to 2 feet long; herbage nearly glabrous; leaflets obovate or obcordate; stipules finely toothed; peduncles 3 to 5-flowered, rather longer than the leaves; pods twisted into a spiral of 2 or 3 turns, compressed, reticulated, the thin keeled edge bordered by a double row of more or less hooked or curved prickles.

Naturalized from Europe, plains, low hills and valleys, 10 to 2000 feet: very common or in places abundant, throughout California. May-June, but often flowering in most places at nearly all seasons.

Note on introduction.—This species was, without reasonable doubt, introduced into California by the Spanish expeditions from Mexico which founded the Franciscan missions, probably in the wool of the sheep brought in for the new settlements. Since that early day it has become widely spread everywhere in the valleys and on the low hills. By cattlemen the plant is prized as a dry season stock feed, since the burs are produced in great quantity and are highly nutritious; it also furnishes a green pasturage in the rainy season. This is a rare instance of an aggressive immigrant herb having a high economic value.

Locs.—San Diego Co. (Orcutt, Fl. S. & L. Cal. check-list, 4); San Bernardino Valley, *Parish* 11,085; Los Angeles, *E. D. Palmer;* Tulare, *Davy* 3128; Berryessa, Santa Clara Co., *Davy* 7063; Berkeley, *Davy* 6551; Antioch, *Jepson* 10,213a; Stockton, *Sanford;* Vacaville, *Jepson;* St. Helena, *Jepson* 10,324; Dry Creek hills, n. of Ione, *Jepson* 15,220; Auburn, *Shockley;* Oroville, *Heller* 11,186; Cahto, Mendocino Co., *Davy* 6622; Scotia, Humboldt Co., *Davy* 5531.

Refs.—MEDICAGO HISPIDA Gaertn. Fruct. 2:349 (1791), type from Europe; Jepson, Fl. W. Mid. Cal. ed. 2, 221 (1911), Man. 534, fig. 522 (1925). *M. denticulata* Willd. Sp. Pl. 3:1414 (1800), type from s. Europe; Jepson, Fl. W. Mid. Cal. 313 (1901).

4. **M. arabica** All. SPOTTED MEDICK. Very similar to no. 3, but the petioles with spreading hairs, the leaflets usually much larger (1 inch long); pods compactly spiral, the margin thicker.

Naturalized from Europe: along the coast from Eureka to San Francisco Bay, uncommon but gradually spreading. Apr.-May.

Locs.—Eureka, *Tracy* 2560; Ft. Ross, Sonoma Co. (Erythea 6:25); Ross Valley, Marin Co., *Bioletti;* Berkeley, *H. A. Walker* 566.

Refs.—MEDICAGO ARABICA All. Fl. Pedem. 1:315 (1785), type from Italy; Jepson, Man. 534 (1925). *M. maculata* Willd. Sp. Pl. 3:1412 (1800), type European; Jepson, Fl. W. Mid. Cal. 313 (1901), ed. 2, 221 (1911).

5. **M. apiculata** Willd. Stems spreading, 1 to 2 feet long; leaflets deltoid, denticulate, except at the base, usually retuse and mucronate at apex, 5 to 6 lines long; pods unarmed or the spines very short, the sides strongly reticulated, the reticulations running to the edge and appearing as a row of tubercles on either side of the margin.

Naturalized from Europe, low valleys, grassy hills and cañons, 10 to 500 feet: widely distributed, but relatively rare. Apr.-May.

Locs.—Crescent City, *Davy* 5928; Redding, *Baker & Nutting;* Eureka, *Tracy* 3156; Norman, Glenn Co., *Davy;* Rio Linda, n. Sacramento Co., *Jepson* 16,558; Dry Creek hills, n. of Ione, *Jepson* 15,217; Knights Ferry, *F. W. Bancroft;* Sonoma Valley, *Jepson* 4768; Pt. Isabel, near Berkeley, *Davy;* San Francisco; New Almaden, *Davy* 283; Santa Cruz Isl. (behind Prisoners Harbor), *Jepson* 12,068; Garvanza, Los Angeles, *Geo. B. Grant.*

Refs.—MEDICAGO APICULATA Willd. Sp. Pl. 3:1414 (1800), type from s. Europe; Jepson, Fl. W. Mid. Cal. 313 (1901), ed. 2, 221 (1911), Man. 534 (1925).

15. **MELILOTUS** Juss. SWEET CLOVER

Annual or biennial herbs with pinnately 3-foliolate leaves and toothed leaflets. Herbage fragrant in drying. Flowers small, yellow or white, in spike-like racemes on axillary peduncles, in bud erect, soon deflexed and not again becoming erect. Calyx 5-toothed. Petals falling after flowering, free from the stamen tube. Stamens diadelphous, the upper one entirely free. Pod ovoid, straight, longer than the calyx, scarcely dehiscent, 1 or 2-seeded.—Species 20, Europe, Asia and Africa. (Greek meli, honey, and lotos, the ancient name of some plant belonging to this family.)

Flowers white; plants 3 to 6 feet high........1. *M. alba.*
Flowers yellow; plants 1½ to 3 feet high........2. *M. indica.*

1. **M. alba** Desr. White Melilot. Erect, simple below, branching above; leaflets broadly or narrowly oblong, tapering to both ends, or widest above the middle, serrate except at the very base, ½ to 1¼ inches long; flowers 2 lines long, in racemes 1 to 4 inches long; banner distinctly longer than the wings; pods somewhat wrinkled.

Naturalized from Europe, in stream bottoms and moist valleys, 10 to 6500 feet: almost throughout California, mostly toward the interior. July-Nov.

Econ. note.—The flowers are a source of nectar for the honey bee. The plant is cultivated for forage though cattle tend to avoid the herbage at first. The pods are sometimes thought to be poisonous to sheep. It is sometimes called Bokhara Clover and Stone Clover.

Locs.—Ft. Bidwell, Modoc Co.; Martin ranch, South Fork Trinity River, *Jepson;* Scott Valley, Lake Co., *Jepson* 13,603; St. Helena *Jepson* 13,602; Alvarado, *Jepson* 13,601; Niles Cañon, *Jepson;* Santa Cruz, acc. *C. A. Reed;* Silver Cañon, White Mts., *Jepson;* Independence, *Jepson* 910; Los Angeles, *E. D. Palmer;* San Bernardino, *Parish;* Riverside, *Jepson;* Buckmans Spr., San Diego Co. (Zoe 2:29).

Refs.—Melilotus alba Desr.; Lam. Encyc. 4:63 (1797), type from Siberia; Jepson, Fl. W. Mid. Cal. 312 (1901), ed. 2, 221 (1911), Man. 534 (1925).

2. **M. indica** All. Yellow Melilot. Main stem erect, with many rather spreading branches from above the base; leaflets broadly or narrowly cuneate-obovate, dentate or serrate but entire below the middle, obtuse, truncate or retuse at apex, ½ to 1¼ inches long; racemes 1 to 2 inches long; flowers 1½ lines long, strongly fragrant; petals equal or subequal; pods with thinnish strongly wrinkled coat.

Naturalized from Europe, valley levels, cañon bottoms and dry stony hillslopes, 10 to 4000 feet: common throughout California. Apr.-May.

Field note.—As a cover crop, especially in orchards, the plant has a value and is frequently so used. In grainfields it is sometimes very abundant; when harvested with the grain the herbage communicates a distasteful flavor to the wheat kernel and so to the flour. It is, thus, called Bitter Clover.

Locs.—Elk Grove, Sacramento Co., *M. C. Richter;* Valley Sprs., Calaveras Co., *Jepson;* Gwin Mine, Calaveras Co., *Jepson;* North Berkeley Hills, *Jepson* 9644; Paicines, San Benito Co., *Jepson* 12,402; Wild Rose Spr., Panamint Range, *Jepson;* San Bernardino, *Jepson;* Riverside, *Jepson;* San Gabriel Mts., *Peirson* 450 (Arroyo Seco), 354 (Tujunga Cañon); Santa Ana, *Alice King;* Mesa Grande, San Diego Co., *E. Ferguson* 112.

Refs.—Melilotus indica All. Fl. Pedem. 1:308 (1785), type European; Jepson, Fl. W. Mid. Cal. 312 (1901), ed. 2, 222 (1911), Man. 535 (1925). *M. parviflora* Desf. Fl. Atlan. 2:192 (1800), type from Algeria.

16. TRIFOLIUM L. Clover

Herbs with palmately compound (or rarely short-pinnate) leaves; leaflets generally 3, sometimes 4 to 7; stipules foliaceous, united at the base and clasping the petiole. Flowers white, yellow, pink, red or purple, in heads. Heads capitate, sometimes loose (umbellate) or short-spicate. Calyx 5-toothed, the lobes equal or nearly so, entire or sometimes bifid or trifid. Petals withering-persistent. Stamens diadelphous. Pod globose to elongated, straight, 1 to 8 (mostly 1 or 2) -seeded, included within the persistent calyx.—Species about 350, mostly temperate and subtropical North America, Europe and Asia, less frequent in South America and Africa, none in Australia. (Latin tres, three, and folium, leaf.)

Bibliog.—Watson, S., Revision of the N. Am. species [of Trifolium] (Proc. Am. Acad. 11: 127–131,—1876). Lojacono, M., Revisione dei Trifogli dell'America settentrionale (Nuov. Giorn. Bot. Ital. 15:113–198, tav. 2–5,—1883). Greene, E. L., Some West American species of Trifolium (Pitt. 1:4–8,—1887); [new West American species of Trifolium], (Pitt. 3:213–224,—1897; 5:107–108,—1903). House, H. D., New and noteworthy N. Am. species of Trifolium (Bot. Gaz. 41:334–347, figs. 1–12,—1906). Kennedy, P. B., Studies in Trifolium (Muhl. 5:1–13, 37–46, 58–61, 100–104, pl. 1,—1909; 5:157–161, pls. 6, 7,—1910; 7:97–100, pls. 6, 7,—1911; 9:1–29, pls. 1–5,—1913). McDermott, L. F., Illustrated key to the N. Am. species of Trifolium, 1–325, pls. 1–136 (1910).

Tax. note.—The number of species here described for California has been increased by three over the number recognized in the Manual of Flowering Plants of California and an attempt has been made to define them more sharply as geographic and ecologic entities. In the diagnoses it is to be understood that the ovary is glabrous unless described otherwise.

A. Heads with an involucre.

1. Corolla conspicuously inflated; annuals.

Involucre present.
Involucral lobes 3 to 9 (commonly about 6 lines long); heads 1 to 2 inches wide; flowers cream-color or yellowish........1. *T. fucatum.*
Involucral lobes 2 lines long or less; heads 4 to 6 lines wide; flowers purple, reddish or white. 2. *T. amplectens.*
Involucre reduced to a ring, or subobsolete........3. *T. depauperatum.*

2. Corolla not inflated (somewhat inflated in no. 12); annuals except nos. 6 and 10.

a. Involucre a flat or spreading disk with variously shaped margin (sometimes of separate segments).

Calyx-teeth dilated and either tridentate or simple.
Plants strictly glabrous; stems commonly not fistulous........4. *T. tridentatum.*
Plants pubescent and clammy; stems fistulous........5. *T. obtusiflorum.*
Calyx-teeth not dilated but subulate, entire.
Heads large; stems commonly thick.
Flowers large, 6 to 7 lines long, purple to pinkish, lighter at the top; heads very densely flowered; perennial........6. *T. wormskjoldii.*
Flowers smaller (mostly 3 to 5 lines long), dark purple, cream-tipped; heads less densely flowered; annual........7. *T. appendiculatum.*
Heads commonly small; stems slender.
Annual; stipules with margin laciniately toothed or divided.
Corolla much longer than calyx; involucre with laciniately toothed lobes........8. *T. variegatum.*
Corolla little longer than calyx; involucre cleft nearly to base into deeply laciniate divisions........9. *T. oliganthum.*
Perennial; stipules with margin entire or nearly so (serrate in one var.); corolla 2 to 3 times as long as calyx; involucre cleft to base or nearly so......10. *T. monanthum.*

b. Involucre campanulate to bowl-shaped.

Lobes of involucre toothed.
Calyx-teeth many-forked, glabrous........11. *T. cyathiferum.*
Calyx-teeth all or all but one simple, hairy or ciliate.
Calyx-teeth plumose, the upper one forked.
Heads 4½ to 7 lines wide; mouth of calyx-tube symmetrical........12. *T. barbigerum.*
Heads 9 to 13 lines wide; mouth of calyx-tube oblique........13. *T. grayi.*
Calyx-teeth ciliate, all simple........14. *T. microdon.*
Lobes of involucre entire; calyx-teeth broadly subulate with scarious margins........15. *T. microcephalum.*

B. Heads naked or with involucre reduced to a vestigial ring or bract (see also no. 3).

1. Perennials

a. Flowers on pedicels mostly 2 to 2½ lines long, recurved in fruit; leaflets obcordate, orbicular or obovate.

Peduncles not recurved at apex, the globose fruiting heads, therefore, erect.
Stems creeping, rooting at the nodes; flowers white or pinkish........16. *T. repens.*
Stems erect or ascending, not rooting at the nodes: flowers pink........17. *T. hybridum.*
Peduncles recurved at apex, the fruiting heads thus appearing as if horizontal........18. *T. breweri.*

b. Flowers sessile or on pedicels ¼ to 1½ lines long; leaflets obovate to linear.

Heads peduncled; mostly Sierra Nevada and extreme northern California.
Peduncles usually abruptly recurved at apex, the heads thus appearing more or less horizontal; flowers reflexed.
Leaflets 3 to 7; calyx-teeth not plumose, sparsely short-hairy........19. *T. lemmonii.*
Leaflets 3; calyx-teeth densely plumose, the young heads appearing woolly........20. *T. eriocephalum.*
Peduncles remaining erect, the fruiting heads, therefore, erect.
Flowers not reflexed or only tardily so.
Leaflets 3........21. *T. longipes.*
Leaflets 5 to 7, rarely 3.
Calyx densely silky-villous, the filiform segments plumose.
Heads exceeding the leaves; stipules ovate-oblong.

Stipules sparsely toothed; heads somewhat spicate; plants not caespitose, the stem simple..............................22. *T. macrocephalum.*

Stipules entire; heads capitate-umbellate; plants caespitose, the stems and leaves matted, the naked peduncles erect..........................23. *T. monoense.*

Heads not exceeding the leaves, somewhat umbellate; stipules lanceolate, entire; stems matted..24. *T. andersonii.*

Calyx pubescent, the lanceolate or subulate-lanceolate segments not plumose; heads few-flowered; plants 1 to 3 inches high........25. *T. gymnocarpon.*

Flowers reflexed in age.

Plants sparsely pubescent above..26. *T. oreganum.*

Plants glabrous throughout.

Rachis produced above the heads; leaflets mostly lanceolate to oblong-lanceolate, acuminate, spinulose-serrate.......................................27. *T. kingii.*

Rachis not produced above the heads; leaflets broader, not acuminate, less deeply toothed.

Stems subscapose, the leaves congested at the base; fruiting heads conical, ½ to ⅔ inch wide; flowers completely reflexed....28. *T. bolanderi.*

Stems leafy; fruiting heads globose to subglobose, 1 to 1¼ inches wide.

Leaflets thin, not venulose, ovate-rhombic or ovate; flowers white, usually all reflexed..29. *T. howellii.*

Leaflets thickish, venulose; flowers red, usually only the lower reflexed..30. *T. beckwithii.*

Heads not peduncled, subtended by the stipules of the sessile upper leaves; stipules scarious, conspicuously veined; flowers not reflexed..31. *T. pratense.*

2. Annuals

a. Flowers pedicellate, in age reflexed.

Plants more or less pubescent.

Petioles shorter than the leaflets; terminal leaflet on a rachis 1 to 2 lines long, the lateral subsessile (leaves pinnate); flowers yellow.

Heads 3 lines broad; banner not dilated..32. *T. dubium.*

Heads 4½ to 5 lines broad; banner dilated...33. *T. procumbens.*

Petioles as long as or longer than leaflets; leaflets all subsessile at the same point (leaves palmate); flowers white to rose-pink; pubescence confined to peduncles and calyces. 34. *T. bifidum.*

Plants strictly glabrous.

Calyx-teeth with bristled or ciliated margins; flowers light pink.......................35. *T. ciliolatum.*

Calyx-teeth with entire margins; flowers rose-red to cream-color..................36. *T. gracilentum.*

b. Flowers sessile, not reflexed.

Heads sessile in pairs, subtended by the stipules of the sessile upper leaves..............37. *T. macraei.*

Heads not sessile.

Corolla exceeding or about equaling the calyx.

Heads 7 to 12 lines wide, globose-ovate; corollas well exserted; stem usually one from the base..38. *T. amoenum.*

Heads mostly 4 to 6 lines wide, cylindric or hemispheric to narrowly ovate; stems 1 to several from the base.

Corollas well exserted...39. *T. dichotomum.*

Corollas barely or not at all exserted..40. *T. albopurpureum.*

Corolla much exceeded by the calyx, entirely obscured by the long-plumose calyx-teeth.......... 41. *T. olivaceum.*

1. **T. fucatum** Lindl. Bull Clover. (Fig. 191.) Stems stout, fistulous, succulent, diffuse, 1 to 2¾ feet long; leaflets rhombic-ovate, 5 to 12 lines broad, broadly dentate, sometimes dentate-setate; heads large, 1 to 2 inches in diameter; involucre 5 to 9-lobed, its margins scarious, entire; flowers pedicellate; stipules large, broadly subulate, acuminate, the margins membranous; corolla cream-color tinged with light green, in age inflating and turning a deep pink; keel dark purple; calyx very small, scarious, the teeth short, 5, unequal; pods stipitate, 3 to 8-seeded.

Low alkaline or brackish clays or on blue adobe, 5 to 3200 feet: throughout cismontane California. North to Oregon. Apr.-June.

Note on variation.—Colonies of this species in moist rich soils are usually coarse-stemmed and large-headed; in alkaline soils slender-stemmed and medium-headed; in stiff hard adobe low-statured and small-headed. And yet, broadly speaking, it may justly be said that in aspect and habit, in character of its vegetative organs and in flowers, Trifolium fucatum is a well-marked species making on the whole, in view of its range and tolerance of various soils, comparatively unimportant exhibition of variability, except in the calyx-teeth. The calyx-teeth are somewhat variable in number and in development, but the character of the variation is more or less indefinite and the named varieties are not sharply differentiated.

Sometimes the leaflets exhibit color markings such as silvery white, faint rose, brown or shades of black, imposed upon the foundation green in the form of designs which are extremely variable in outline. For example we may find a strain at a given station, as in the Diablo Range, uniformly exhibiting leaflets with a narrow irregular transverse whitish band midway of the leaflets. Or again, as in a field at Suisun, each individual has its own leaf pattern, no two being alike.

In seasons of average precipitation T. fucatum develops abundantly a rank growth in its favored areas. Frequently it is common along country lanes, but doubtless because the lanes are often preserves of the primitive vegetation and have been little changed by industrialism. The plant has been called Sour Clover, but wrongly, its herbage and flowers furnishing a sweet salad. It is also called Farded Clover.

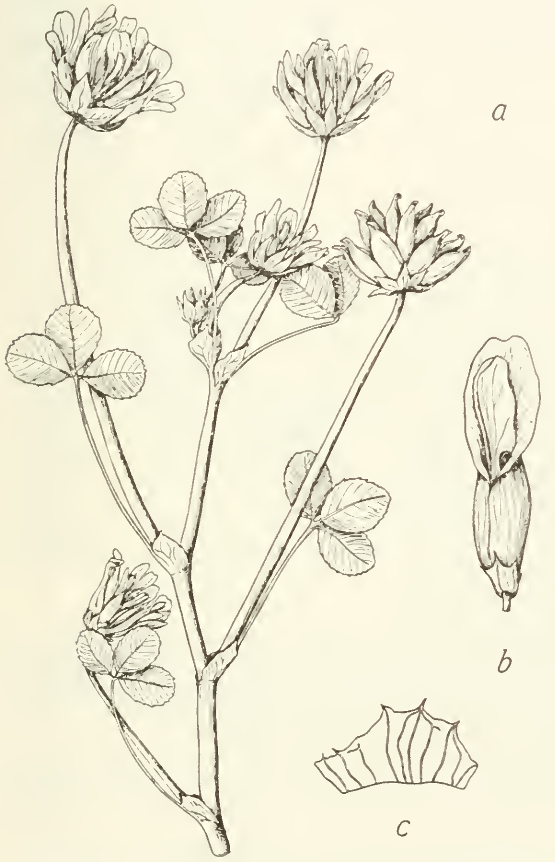

Fig. 191. Trifolium fucatum Lindl. *a*, flowering branchlet, × ½; *b*, fl., × 2; *c*, calyx spread open, × 6.

Locs.—Coastal S. Cal.: San Bernardino, *Parish.* Coast Ranges: Diablo Range, sw. Fresno Co., *Jepson* 15,397; Mt. Diablo, *Jepson* 9857; West Berkeley, *Tidestrom;* Suisun, *Jepson* 9621; Conn Valley, Napa Range, *Jepson* 6256. Great Valley: Vacaville, *Jepson* 13,715; Willows, Glenn Co., *Jepson* 13,717; Sutter plains, *Jepson* 13,714.

Var. virescens Jepson. Smaller; leaflets spatulate, pectinate to pectinate-dentate; calyx-teeth reduced to 3, longer than the calyx-tube; pod 3-seeded.—Dry hills or moist valleys, 5 to 1400 feet: mostly North Coast Ranges.

Locs.—Rutherford, Napa Valley, *Jepson* 13,742; Calistoga, *Jepson* 13,722; Cannon sta., Solano Co., *Jepson* 6789; Fort Bragg, *Mathews* 1; Redding, *Blankinship;* Bridgeville, Humboldt Co., *Tracy* 6203; Morleys sta., Shasta Co., *Baker & Nutting.*

Var. gambelii Jepson. Procumbent and very succulent; leaflets rhombic, thick, glaucous; calyx-teeth 5, very long, 2 to 3-cleft.—Coastal Southern California; South Coast Ranges.

Locs.—Los Angeles, *E. D. Palmer;* near Gaviota Pass, Santa Barbara Co., *Brewer* 393; Estrella, San Luis Obispo Co., *Jared;* Danville, Contra Costa Co., *Davy.*

Var. **flavulum** Jepson. Procumbent as in var. gambelii; leaflets small, rotund-obovate; calyx-teeth 5, simple, equaling or exceeding the calyx-tube.—Coastal region, 5 to 1400 feet: San Diego Co. to Lake Co.

Locs.—San Diego, *K. Brandegee;* Puente Hills, s. Los Angeles Co., *Johnston* 1895; Morro, San Luis Obispo Co., *Barber;* Saratoga, Santa Clara Co., *Pendleton* 337; West Berkeley, *Tidestrom;* Wild Cat Creek, Berkeley Hills, *Jepson* 13,720; St. Helena, *Jepson* 13,719; Vacaville, *Jepson* 13,718; Lakeport, *Tracy* 5521.

Refs.—Trifolium fucatum Lindl. Bot. Reg. t. 1883 (1836), type cult., seeds from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. 310 (1901), ed. 2, 223 (1911), Man. 537, fig. 524 (1925); McDer. N. Am. Sp. Trifolium 147, pls. 54–56 (1910). *T. physopetalum* F. & M. Ind. Sem. Petrop. 3:47 (1836), type loc. Bodega Bay. Var. virescens Jepson, Fl. W. Mid. Cal. 311 (1901), Man. 537. *T. virescens* Greene, Pitt. 2:223 (1892), type loc. Marin and Sonoma Cos. *T. fucatum* f. *virescens* McDer. l.c. 152, pl. 57; Jepson, Fl. W. Mid. Cal. ed. 2, 223 (1911). Var. gambelii Jepson, Fl. W. Mid. Cal. 311 (1901), ed. 2, 223 (1911), Man. 537; McDer. l.c. 155, pls. 58, 59. *T. gambelii* Nutt. Jour. Acad. Phila. n. ser. 1:151 (1848), "Island of Catalina, St. Simeon and Pueblo de los Angeles", *Gambel.* Var. FLAVULUM Jepson, Fl. W. Mid. Cal. 310 (1901), Man. 537. *T. flavulum* Greene, Pitt. 2:223 (1892), type loc. w. Cal. *T. fucatum* var. *gambelii* f. *flavulum* McDer. l.c. 158, pl. 60; Jepson, Fl. W. Mid. Cal. ed. 2, 223 (1911).

2. **T. amplectens** T. & G. Bladder Clover. (Fig. 192.) Stems commonly several or many from the base, rather stout, decumbent or ascending, 6 to 15 inches high; herbage glabrous; leaflets obovate to oblanceolate, emarginate to truncate, cuneate at base, serrate, ¼ to ¾ inches long; stipules broadly ovate or obovate, acuminate, scarious-margined; heads 4 to 11-flowered; involucre 6 or 7-lobed, the lobes rounded to oblong, scarious-margined, entire or occasionally toothed, equaling or exceeding the calyx-teeth; corolla white or purple, inflated; pods 3 to 8-seeded.

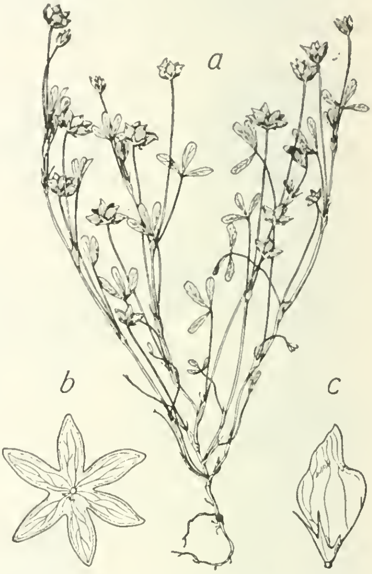

Fig. 192. TRIFOLIUM AMPLECTENS T. & G. *a*, habit, × ½; *b*, involucre, × 3; *c*, fl., × 3.

Rich soil of low plains and foothills, 5 to 2300 feet: Great Valley; Coast Ranges from Lake Co. to San Luis Obispo Co.; coastal Southern California. Mar.-May.

Locs.—The type of Trifolium amplectens T. & G. is a plant with cuneate-obovate leaflets; this form of it is somewhat uncommon. The type of T. stenophyllum Nutt. is a plant having linear leaflets, examples of which are common. Plants with intermediate forms of foliage are, however, more numerous than the extremes represented by the types of these two forms. There are no other constant differences between them. We cite the following, with every gradation of leaflet shape from obovate to oblanceolate or linear-oblanceolate and linear. Great Valley: Corning, Tehama Co., *Blankinship;* Folsom, ne. Sacramento Co., *Jepson* 15,745; Vacaville, *Jepson* 13,734; Clements, San Joaquin Co., *Jepson* 15,204; Byron, *Greene;* Lone Willows sta., Fresno Co., *Jepson* 11,584; Wideawake ranch, Madera Co., *Jepson* 15,151; Visalia, *E. B. Homer.* Coast Ranges: Kelseyville, Lake Co., *Irwin* 62; Calistoga, *Jepson* 13,723; Conn Valley, Napa Range, *Jepson* 6244; Vallejo, *Blankinship;* Mill Valley, Marin Co., *Tidestrom;* Oakland Hills, *Jepson* 6867; Lafayette, Contra Costa Co., *Tidestrom;* Carmel, *Newlon* 107; Cuesta Pass, Santa Lucia Mts., *Jepson* 11,960; Morro Creek, San Luis Obispo Co., *Peirson* 5668. S. Cal.: Santa Cruz Isl., *T. Brandegee;* Santa Catalina Isl. (Erythea 7:144); Stonewall Mine, San Diego Co., *Parish* 4417; Cuyamaca Lake, *Peirson* 5972; La Jolla, San Diego Co., *Jepson* 11,847, 11,848; San Diego, *Jepson* 6665, 6676.

Var. **diversifolium** Jepson. Heads many (8 to 15)-flowered; involucre very small, 6 to 9-lobed, the lobes ⅓ line long.—Salt marshes and alkaline areas, 5 to 120 feet: Colusa jct., Colusa Co., *K. Brandegee;* Alameda, *Tidestrom;* Alviso, Santa Clara Co., *Bioletti;* San Luis Obispo, *Summers.*

Var. **truncatum** Jepson. Leaflets ¾ to 1 inch long; heads with the flowers in 2 whorls (rarely 1), the inner whorl subtended by a very small involucral ring.—Plains and valley floors, 5 to 200 feet: Great Valley; Contra Costa and Alameda Cos.

Locs.—Great Valley: Red Bluff, *Jepson* 13,730; Marysville, *Heller* 7564; College City, Colusa Co., *Alice King;* Sacramento, *Bolander* 4502; Vacaville, *Jepson* 13,732; Caliente, Kern Co., *Heller* 7620. Contra Costa and Alameda Cos.: Antioch, *Davy* 993; Oakland (Temescal), *Davy;* Livermore Valley, *Jepson* 13,731.

Refs.—TRIFOLIUM AMPLECTENS T. & G. Fl. 1:319 (1838), type from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. 311 (1901), Man. 537 (1925). *T. depauperatum* var. *amplectens* McDer. N. Am. Sp. Trifolium 142 (1910); Jepson, Fl. W. Mid. Cal. ed. 2, 223 (1911). *T. stenophyllum* Nutt. Jour. Acad. Phila. n. ser. 1:151 (1847), type loc. Santa Catalina Isl., *Gambel. T. depauperatum* var. *stenophyllum* McDer. l.c. 137; Jepson, Fl. W. Mid. Cal. ed. 2, 223 (1911). *T. amplectens* var. *stenophyllum* Jepson, Man. 537 (1925). *T. franciscanum* Greene, Man. Reg. S. F. Bay 100 (1894), type loc. San Francisco. *T. depauperatum* var. *stenophyllum* f. *franciscanum* McDer. l.c. 140; Jepson, l.c. *T. anodon* Greene, Pitt. 5:107 (1903), type loc. San Diego, *T. Brandegee* 828. *T. brachyodon* Greene, l.c., type loc. Santa Catalina Isl., *Trask. T. decodon* Greene, l.c. 108, type loc. San Diego, *T. Brandegee* 3371. Var. DIVERSIFOLIUM Jepson, Man. 537 (1925). *T. diversi-*

folium Nutt. Jour. Acad. Phila. n. ser. 1:152 (1847), type loc. "near St. Simeon, Upper California", *Gambel*. *T. depauperatum* var. *diversifolium* McDer. l.c. 135; Jepson, Fl. W. Mid. Cal. ed. 2, 223 (1911). *T. hydrophilum* Greene, Man. Reg. S. F. Bay 100 (1894), cent. "seaboard" of California. *T. amplectens* var. *hydrophilum* Jepson, Fl. W. Mid. Cal. 311 (1901). Var. TRUNCATUM Jepson, Man. 537 (1925). *T. franciscanum* var. *truncatum* Greene, Man. Reg. S. F. Bay 100 (1894), type loc. Napa and Solano Cos. *T. truncatum* Greene, Proc. Acad. Phila. 47: 546 (1896). *T. depauperatum* var. *amplectens* f. *truncatum* McDer. l.c. 144; Jepson, Fl. W. Mid. Cal. ed. 2, 224 (1911).

3. **T. depauperatum** Desv. ALKALI CLOVER. Stems slender, ascending, 4 to 8 inches high; herbage glabrous; leaflets cuneate-emarginate, denticulate, 3 to 5 lines long; peduncles slender, wiry; heads loose, 2 to 7-flowered, 5 to 10 lines long; involucre an exceedingly small or reduced ring; calyx-teeth triangular-subulate, shorter or longer than the tube; corolla whitish to purple, becoming inflated, the banner enclosing the small wings and keel; pods stipitate, 2 to 6-ovuled, commonly 2-seeded.

Alkaline valleys, or flats in the hills, 25 to 2500 feet: Coast Ranges from Alameda Co. to Humboldt Co.; Sacramento Valley. North to Oregon. Chile. Mar.-May.

Locs.—Coast Ranges: Alameda, *Jepson* 13,736; Byron Sprs., Contra Costa Co.; Mt. George, Napa Range, *Jepson* 13,738; St. Helena, *Jepson* 13,739; Sherwood Valley, Mendocino Co., *Davy* 5192; Kneeland Prairie, Humboldt Co., *Tracy* 5480. Sacramento Valley: Peaceful Glen, nw. Solano Co., *Jepson* 9613; Oroville, *Heller* 10,732; Anderson, Shasta Co., *Alice King*.

The following leaf forms are rather marked. Var. LACINIATUM Jepson. Leaflets laciniately toothed or lobed.—Eastern Contra Costa Co. Var. ANGUSTATUM Jepson. Leaflets narrowly linear, entire or dentate, 5 to 6 lines long.—Lone Willows sta., Fresno Co., *Jepson* 13,735; Sonoma Valley, *Brewer* 980; Calistoga, *Jepson* 13,737.

Refs.—TRIFOLIUM DEPAUPERATUM Desv. Jour. Bot. 4:69, t. 32 (1814), type loc. "western coasts of both North and South America"; Jepson, Fl. W. Mid. Cal. 311 (1901), ed. 2, 223 (1911), Man. 537, fig. 525 (1925); McDer. N. Am. Sp. Trifolium 131, pl. 47 (1910). Var. LACINIATUM Jepson, Fl. W. Mid. Cal. 311 (1901), Man. 538 (1925). *T. laciniatum* Greene, Pitt. 1:7 (1887), type loc. Byron Sprs., Contra Costa Co., *Greene*. *T. depauperatum* f. *laciniatum* McDer. l.c. 133, pl. 48; Jepson, Fl. W. Mid. Cal. ed. 2, 223 (1911). Var. ANGUSTATUM Jepson, Man. 538 (1925). *T. laciniatum* Greene var. *angustatum* Greene, Man. Reg. S. B. Bay 101 (1894), type loc. Byron Sprs., *Greene;* Jepson, Fl. W. Mid. Cal. 311 (1901).

4. **T. tridentatum** Lindl. TOMCAT CLOVER. Stems several from the base, erect or ascending, 4 to 20 inches high; leaflets linear-oblong to lanceolate, serrate-setate to entire, ½ to 1⅜ inches long; stipules laciniate-toothed, erect; heads hemispherical, broader than long, ¾ to 1⅜ inches broad, the flowers standing out conspicuously, the wings protruding at right angles from the tube-like fold of the banner; involucre more or less deeply cleft into narrow lanceolate lobes; flowers 6 to 7 lines long; calyx-teeth shorter than the calyx-tube, spine-tipped, dilated below, the dilated portion sometimes raised into a shoulder or a very short sharp tooth on each side; corolla bright to light purple, often white-tipped; pods mostly 2-seeded.

Valleys, plains, hillslopes and cañons, 50 to 4600 feet: coastal Southern California; Coast Ranges; Great Valley. North to British Columbia. Mar.-June.

Variation.—Trifolium tridentatum Lindl. is one of the most abundant and widespread clovers of the valleys and lower foothills west of the Sierran crests, often dominating acres and acres, especially in April and May. It has a fairly distinctive habit. The heads come into anthesis inequilaterally and the corollas assume in their parts a characteristic pose. The field student does not mistake it for any other species, because its organs are sufficiently uniform within certain allowable limits of variation. Notwithstanding the considerable number of synonyms here listed, it is not an especially variable species. Variability is most marked in the calyx. The calyx-teeth, dilated below, may end in a long spine (var. aciculare McDer.); the dilation may be more or less raised into a shoulder on one or both sides; one or both the shoulders may be more or less tooth-like, in rare cases subulate or ending in a very short spine (var. segetum McDer.). Greene's Trifolium segetum was based on such a plant as a spm. from Alameda (*Tidestrom*, May 16, 1895) in which the lateral teeth are short-acicular and unusually long (¼ to ⅓ line). The fallacy of species based on such features is shown by a remarkable sheet (illustrating T. segetum) collected at Tracy by Benj. Cobb, consisting of two branchlets essentially identical, save that in one the calyx-teeth are, most of them, similar to those of the Alameda spm. of Tidestrom, in the other the calyx-teeth are not toothed, or rarely so in an obscure manner. All such calyx states pass into one another; any two of them may not infrequently be found on one individual; and in no case are they definitely and constantly associated with distinctive features in other organs, nor have they any apparent geographic segregation. In no case are the calyx-teeth tridentate in the sense of having three equal or subequal teeth. Plants with similar calyces or involucres may be either robust or slender, with small or large heads, with oblong or linear leaflets, or may combine other variations common within the species. Well-known to the folk on account of its rank growth, it is called by various names, one being Bull Clover, another Sour Clover, still another Strawberry Clover.

Locs.—Coastal S. Cal.: Cuyamaca Lake, *Peirson* 5971; Mesa Grande, *Ferguson* 36; San Diego, *Jepson* 6662; La Jolla, *Jepson* 11,873; Banning, *Gilman;* San Bernardino, *Parish;* Eaton Cañon, San Gabriel Mts., *Peirson* 423; Santa Catalina Isl. (Erythea 7:144); Pelican Bay, Santa Cruz Isl., *Jepson* 12,121. Coast Ranges: Cuesta Pass, Santa Lucia Mts., *Jepson* 11,961; Mt. Hamilton, *Jepson* 4201, 8236; Corral Hollow, se. Alameda Co., *Jepson* 9581; Niles Cañon, *Jepson* 2474; Mt. Diablo, *Jepson* 10,691; Berkeley, *Greene;* Weldon Cañon, Vaca Mts., *Jepson* 13,677; Sonoma Valley, *Jepson* 4191; Yountville, *Jepson* 13,674; St. Helena, *Jepson* 13,672; Calistoga, *Jepson* 9183; Geyser Cañon, n. Sonoma Co., *M. S. Baker* 645; Ukiah, *Jepson* 9282; Mail Ridge, Humboldt Co., *Jepson* 1904; Willits, Mendocino Co., *Jepson* 2481; Longvale, Mendocino Co., *Jepson* 12,382. Great Valley: Rosedale, Kern Co., *Davy;* Patterson, Stanislaus Co., *Jepson* 11,568; Vacaville, *Jepson* 13,679; Mills sta., n. Sacramento Co., *Jepson* 15,729; Marysville Buttes, *Jepson* 13,678; Corning, *Blankinship;* Red Bluff, *Jepson* 13,675.

Var. **watsonii** Jepson comb. n. Leaflets often narrowly linear (commonly 1 to 1¾ inches long, ⅓ to 1½ lines wide); involucre much reduced, the divisions triangular; calyx-tube conspicuously elongated, the lobes very short, simple or toothed; herbage often purple-tinged; stipules and calyx deep purple.—Fields and hill slopes, 125 to 5300 feet: Sierra Nevada foothills from Fresno Co. to Butte Co.

Locs.—Dunlap, Fresno Co., *Jepson* 2757; Bootjack, Mariposa Co., *Jepson* 12,785; Columbia, Tuolumne Co., *A. L. Grant* 697; Parrotts Ferry, Stanislaus River, *A. L. Grant* 72a; Gwin Mine, Calaveras Co., *Jepson* 1778, 1787; Willow Sprs. sta., Amador Co., *Jepson* 15,250; Salmon Falls, Eldorado Co., *Jepson* 15,756; Auburn, *Shockley;* Yankee Jim, Placer Co., *L. S. Smith* 1613; Big Chico Creek, Butte Co., *Heller* 10,712.

Var. **clivorum** Jepson var. n. Plants very robust; stems rigid, simple or branched, 1½ to 3 lines in diameter, 2 to 2½ feet high; leaflets linear, 1 to 2¼ inches long; heads large, broadly conical, 1 to 1¼ inches high, the corollas conspicuous, exceeding the calyx by about 6 lines; calyx teeth long-acicular, simple or tridentate, the lateral teeth short.—(Plantae robustissimae; capitula magna, late conoidea, unc. 1–1¼ alta; corollae manifestae, de lin. 6 calycem superantes; calycis dentes simplices vel tridentati, dente medio aciculare, dentibus lateralibus brevibus.)—Valleys in the foothills of Mariposa Co., 1300 to 1500 feet: Cathay Valley, *Jepson* 12,763 (type); Ruth Pierce Mine above Hornitos, *Jepson* 10,714.

Var. **polyodon** Jepson comb. n. Stems flaccid, 1 to 1⅓ feet high; stipules laciniate, the margins or tips reflexed; leaflets obovate, serrulate, 3 to 11 lines long; involucre not deeply lobed, each lobe many-toothed; heads 4 to 7 lines broad; calyx turbinate, 10-nerved, reticulate, the teeth tridentate or multifid; corolla dull purple, fading to white at the top; pods 2-seeded.—Moist hillslopes, 20 to 300 feet: Pacific Grove, *Heller* 6707. In its habit and size of its heads this form is more nearly like T. variegatum Nutt. than T. tridentatum Nutt. The reflexed stipules are also reminiscent of certain forms of T. variegatum in the South Coast Ranges.

Refs.—TRIFOLIUM TRIDENTATUM Lindl. Bot. Reg. sub t. 1070 (1827), type loc. Columbia River, *Douglas;* Jepson, Fl. W. Mid. Cal. 309 (1901), ed. 2, 224 (1911), Man. 538, fig. 526 (1925); McDer. N. Am. Sp. Trifolium 19, pls. 3, 4, 5 in part (1910). *T. trimorphum* Greene, Pitt. 3:220 (1897), type loc. Alameda and Contra Costa Cos. (leaflets trimorphic; flowers whitish or flesh color). *T. tridentatum* f. *trimorphum* McDer. l.c. 20, pl. 6; Jepson, Fl. W. Mid. Cal. ed. 2, 224 (1911). *T. tridentatum* var. *melananthum* Wats. Proc. Am. Acad. 11:130 (1876) (flowers smaller, ex char.). *T. segetum* Greene, Pitt. 3:221 (1897), type loc. "Middle California". *T. tridentatum* var. *segetum* McDer. l.c. 24; Jepson, Fl. W. Mid. Cal. ed. 2, 224 (1911), Man. 538 (1925). *T. aciculare* Nutt.; T. & G. Fl. 1:319 (1838), type loc. Santa Barbara, *Nuttall. T. tridentatum* var. *aciculare* McDer. l.c. 26, pl. 7; Jepson, Fl. W. Mid. Cal. ed. 2, 224 (1911), Man. 538 (1925). *T. polyphyllum* Nutt. l.c., type loc. Santa Barbara, *Nuttall* (leaflets 3 to 5). *T. scabrellum* Greene, Pitt. 1:159 (1888), type loc. Visalia, *Patterson* (slightly scabrous). Var. WATSONII Jepson. *T. watsonii* Loja. Nuov. Giorn. Bot. Ital. 15:186 (1883), type loc. Chico, Butte Co., *Anna Bidwell. T. tridentatum* var. *aciculare* f. *watsonii* McDer. l.c. 28; Jepson, Fl. W. Mid. Cal. ed. 2, 224 (1911). Var. CLIVORUM Jepson. Var. POLYODON Jepson. *T. polyodon* Greene, Pitt. 3:215 (1897), type loc. Pacific Grove, *Greene;* McDer. N. Am. Sp. Trifolium 93, pl. 34 (1910); Jepson, Fl. W. Mid. Cal. ed. 2, 225 (1911), Man. 538 (1925).

5. **T. obtusiflorum** Hook. CREEK CLOVER. (Fig. 193.) Stems stout, erect or decumbent-ascending, fistulous, 12 to 17 inches high; herbage clammy-hispidulous

throughout; leaflets obovate-oblanceolate or oblanceolate, obtuse or acute, fringed-serrate, ¾ to 1½ (or 2) inches long; stipules laciniately toothed; peduncles 1 to 3 inches long; heads large, ¾ to 1½ inches wide; involucres 7 to 9 lines wide, laciniately divided from ⅓ to ½ its length, the numerous acicular divisions often toothed near the base; flowers 6 to 8 lines long; calyx-tube 10 to many-nerved, the teeth entire (rarely tridentate), dilated near the base; corolla white with a bright purple spot at the center, much exceeding the calyx; pods 2-seeded.

Moist swales or creek bottoms, 300 to 4250 feet: throughout cismontane California but not abundant. North to southwestern Oregon. June-July.

Native uses.—Both in the Sierra Nevada of Fresno Co. and in the North Coast Ranges, the green herbage of this species is used as food by members of the native tribes. On account of its acid or salty taste it is called Salt Clover or Sour Clover. Cattle are fond of it and follow the little creeks where it grows, cropping it closely. It is also called Spring Clover.

Locs.—Coastal S. Cal.: Cedar Cañon betw. El Nido and Dulzura, *Forbes;* Palomar Mt., *Jepson* 1533; San Bernardino, *Parish.* Coast Ranges: San Miguelito Rancho, Santa Lucia Mts., *Jepson* 1634; Miller Cañon, Vaca Mts., *Jepson* 13,689; Hough Sprs., n. Lake Co., *Jepson* 9011; Wise Creek, s. Mendocino Co., *Jepson* 9291; Fort Bragg, *W. C. Mathews* 91; Hupa, *Chandler* 1322. Great Valley: Visalia, *Greene.* Sierra Nevada: Pine Ridge, Fresno Co.; Hetch-Hetchy, *Jepson* 3423; Angels Camp, *Jepson* 10,424; North Fork Calaveras River n. of San Andreas, *Jepson* 9942; Table Mt., n. of Oroville, *Heller* 10,771.

Refs.—TRIFOLIUM OBTUSIFLORUM Hook. Ic. Pl. t. 281 (1840), type loc. near Monterey, *Douglas;* McDer. N. Am. Sp. Trifolium 30, pl. 5 (in part), 8, 9 (1910); Jepson, Fl. W. Mid. Cal. 309 (1901), ed. 2, 224 (1911), Man. 538 (1925). *T. tridentatum* var. *obtusiflorum* Wats. Proc. Am. Acad. 11:130 (1876). *T. roscidum* Greene, Fl. Fr. 31 (1891), type loc. Sierra Nevada foothills (Jackson, Amador Co.). *T. majus* Greene, Pitt. 3:214 (1897), herbage resinous-glandular.

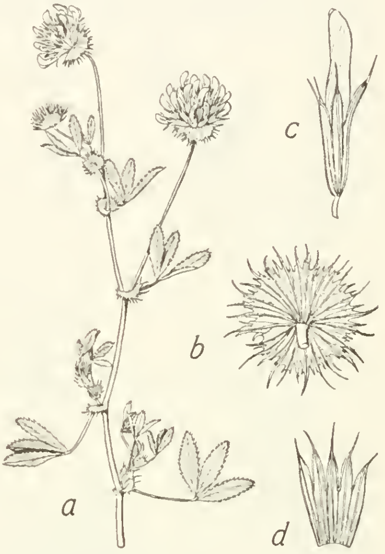

Fig. 193. TRIFOLIUM OBTUSIFLORUM Hook. *a*, branchlet, × ⅓; *b*, involucre, × 1; *c*, fl., × 1½; *d*, calyx spread open, × 1½.

6. **T. wormskjoldii** Lehm. COW CLOVER. Stems thick but flaccid, low-caespitose or tall (4 to 24 inches high); herbage strictly glabrous; petioles long; small leaflets obcordate or obtuse-oblanceolate, about 2 to 3 lines long; large leaflets oblong, ovate, obovate or rhombic-oblanceolate, serrulate-setate, mostly obtuse, about 5 to 14 lines long; stipules laciniate; heads large, showy, ¾ to 1⅛ inches broad, each whorl often subtended by a secondary involucre; involucre deeply or slightly lobed, each lobe 3 to 5-toothed; calyx 10-nerved; corolla purple, rose-red or pinkish, lighter at the top; pods 2 to 6-seeded.

Frequent along streams, by springs or in salt marshes, 10 to 8000 feet: throughout California from the coasts to the deserts and in the mountains, but not on the dry plains of the Great Valley. East to the Rocky Mts., south to Mexico. Apr.-July.

Locs.—East of the Sierra Nevada crest: Crowder Flat, Warner Range, *L. S. Smith* 1183; Walker Lake, Mono Co., *Jepson* 4445; Wells ranch ranger sta., Inyo Co., *Kennedy.* Sierra Nevada: Morley sta., Shasta Co., *M. S. Baker;* Prattville, *Platt;* Bear Valley, Nevada Co., *Jepson* 13,651; Confidence, Tuolumne Co., *Jepson* 7698; Brightman Flat, Tuolumne Co., *A. L. Grant* 899; Huckleberry Creek, Huntington Lake, *Jepson* 13,069; Arnold Mdw., Fresno Co., *A. L. Grant* 1389. Delta region: Denverton, Solano Co., *Jepson* 13,653. Coast Ranges: Yreka, *Butler* 381; Korbel to Angels ranch, n. Humboldt Co., *Jepson* 1934; Little River beach, Humboldt Co., *Tracy* 4801; Shelter Cove, sw. Humboldt Co., *Tracy* 4991; DeHaven to Ft. Bragg, *Jepson* 13,652; Howell Mt., *Jepson* 13,654; South Los Guilicos, Sonoma Co., *Bioletti;* North Berkeley Hills, *Jepson* 9671; Mt. Diablo, *Jepson* 13,655; San Jose, *Rattan;* Año Nuevo Pt., San Mateo Co., *Cooper* 205; Carmel, *Newlon* 113. S. Cal.: Rock Creek, San Gabriel Mts., *Peirson* 485; San Bernardino Valley, *Parish;* Tustin, Orange Co., *Alice King;* San Diego, *T. Brandegee.*

Var. **fimbriatum** Jepson comb. n. Leaflets spinulose-margined, acute or acuminate, recurved at tip (in extreme form), 1 to 1¼ inches long; involucre divided into entire subulate divisions.—Wet meadows and margins of streams, 4000 to 7500 feet: Sierra Nevada from Tulare Co. to Siskiyou Co.: Bubbs Creek, Fresno Co., *Jepson* 784; Honey Lake Valley, *Davy* 3347; Forestdale, sw. Modoc Co., *M. S. Baker;* Sisson, Siskiyou Co., *Jepson* 13,650.

Var. **kennedianum** Jepson comb. n. Dune Clover. Plants 2 to 6 inches high, the stems often erect; leaflets obcordate, 2 to 4 (or 9) lines long; involucres sometimes much reduced in size and sometimes with simple teeth.—Sand dunes along the coast: Del Norte Co. to Monterey Co. May-Aug. The involucres are not often reduced to the minute size of those in the type specimens of this variety; or again, involucres much reduced may occur in plants having the habit usual to the species rather than to the variety.

Locs.—Requa beach, Del Norte Co., *Jepson* 9340 (involucres less reduced); Big Lagoon, Humboldt Co., *Tracy* 6273 (involucres about as usual for the species); Eureka, *Shockley;* San Francisco, *Blasdale;* Moss Beach, San Mateo Co., *K. Brandegee;* Pacific Grove, *Chandler* 316.

Refs.—Trifolium wormskjoldii Lehm. Ind. Sem. Hort. Ham. 17 (1825), type a cult. plant, the seed from Cal., *Wormskjold;* Pugillus 1:36 (1828); Jepson, Fl. W. Mid. Cal. 309 (1901). *T. involucratum* Ortega, Hort. Reg. Bot. Matr. 33 (1797), type from Cuba; McDer. N. Am. Sp. Trifolium 39, pls. 10–12 (1910); Jepson, Fl. W. Mid. Cal. ed. 2, 224 (1911), Man. 539, fig. 527 (1925),—not T. involucratum Lam. (1778). *T. heterodon* T. & G. Fl. 1:318 (1838), "Oregon and California". *T. involucratum* var. *heterodon* Wats. Proc. Am. Acad. 11:130 (1876). *T. calocephalum* Nutt.; T. & G. l.c., type loc. Santa Barbara, *Douglas, Nuttall. T. fendleri* Greene, Pitt. 3:221 (1897), "southern Colorado and northern New Mexico". *T. involucratum* var. *fendleri* McDer. l.c. 47, pls. 13, 14; Jepson, Man. 539. Var. fimbriatum Jepson. *T. fimbriatum* Lindl. Bot. Reg. t. 1070 (1827), type loc. "Columbia River", *Douglas. T. involucratum* var. *fimbriatum* McDer. l.c. 52, pls. 16, 17; Jepson, Man. 539. *T. spinulosum* Dougl.; Hook. Fl. Bor. Am. 1:133 (1830), type loc. "vallies between Spokane and Kettle Falls, Northwest America", *Douglas. T. spinulosum* var. *triste* T. & G. Fl. 1:318 (1838), type loc. Santa Barbara, *Nuttall.* Var. kennedianum Jepson. *T. involucratum* var. *kennedianum* McDer. l.c. 56, pl. 18 (1910), type loc. Requa beach, Del Norte Co., *P. E. Goddard;* Jepson, Man. 539.

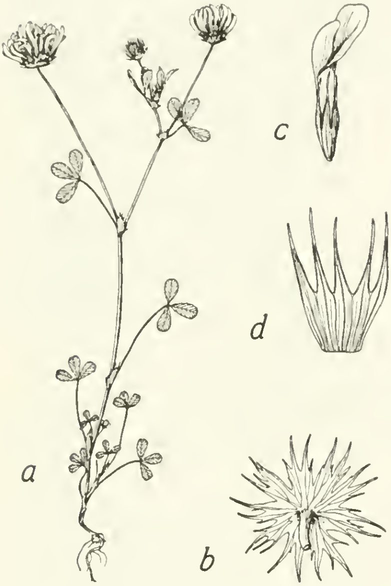

Fig. 194. Trifolium appendiculatum Loja. *a*, habit, × ⅓; *b*, involucre spread open, × 2; *c*, fl., × 2½; *d*, calyx spread open, × 3.

7. **T. appendiculatum** Loja. Lost Clover. (Fig. 194.) Stems erect or diffuse, thick and fistulous or sometimes slender, 3 to 17 inches long; glabrous, stipules reflexed or spreading, irregularly laciniate; leaflets broadly obovate, obtuse or retuse, 2 to 8 (or 14) lines long; involucre 7 to 9-lobed, the lobes 3 to 5-toothed; heads mostly large and showy (5 to 14 lines broad); calyx-teeth subulate, entire; corolla dark-purple, cream-tipped; beak of keel long-apiculate; pods 2-seeded.

Moist grassy hills mostly near the coast, 10 to 1400 feet: Humboldt Co. to Sonoma Co.; Monterey Co. Rare. May-June.

Locs.—Eureka, *Tracy* 3714; Alton, Humboldt Co., *Tracy* 7145; Shelter Cove, *Tracy* 4990; Willits, *Jepson* 2483, 2487a; Potter Valley, Mendocino Co., *Purpus;* Lakeport, *Tracy* 5504; Wright School, Sonoma Co., *M. S. Baker* 3597b; Pt. Reyes, *Davy* 6728; Pacific Grove, *Heller* 6691.

Var. **rostratum** Jepson. Dwarf, 3 to 4 inches high; leaflets small, obcordate, on long filiform petioles; involucre 4-lobed, each lobe 3 to 4-toothed; heads small, few-flowered; keel rostrate.—Alameda Co.; Marin Co.; Hydesville, Humboldt Co., *Tracy* 3584.

Refs.—Trifolium appendiculatum Loja. Nuov. Giorn. Bot. Ital. 15:181 (1883), type loc. "coast fields, California", *Lemmon;* McDer. N. Am. Sp. Trifolium 86, pl. 32 (1910); Jepson, Fl. W. Mid. Cal. 309 (1901), ed. 2, 224 (1911), Man. 539 (1925). *T. splendens* Hel. Muhl. 1:115 (1905), type loc. Pacific Grove, *Heller* 6691. Var. rostratum Jepson, Man. l.c. *T. rostratum*

Greene, Proc. Acad. Phila. 47:547 (1896), type loc. Lake Merritt, Oakland, *Chesnut*. *T. appendiculatum* f. *rostratum* McDer. l.c. 92, pl. 33; Jepson, Fl. W. Mid. Cal. ed. 2, 224 (1911).

8. **T. variegatum** Nutt. WHITE-TIP CLOVER. Stems slender, often several from the base and freely branching, decumbent or ascending, ½ to 2 feet high; herbage strictly glabrous; stipules ovate, laciniately toothed; leaflets commonly obovate, sometimes oblong-oblanceolate, very small to large (2 to 7 lines long); peduncles slender; heads irregularly subglobose, 3 to 6 lines broad, few to many-flowered; involucre much smaller, 4 to 12-lobed, the lobes 3 to 7-toothed; flowers small; corolla purple, white-tipped or purple throughout; calyx 5 to 20-nerved, its teeth subulate-setaceous, often purple, simple or one tooth bifid; pods 1 or 2-seeded.

Low or moist places, 20 to 4000 feet: widely distributed and common throughout cismontane California; rare east of the Sierran crests. North to British Columbia. Apr.-May.

Distributional note.—Trifolium variegatum is one of the five most abundant clovers in California, and grows in a wide variety of hill, valley and plains country. It is somewhat variable and in so extensive a range it is probable that a considerable number of local forms will, in time, be defined. In the South Coast Ranges from Santa Cruz Co. to San Luis Obispo Co. we often find plants with reflexed stipules. Such plants may in some cases belong to the species, in other cases to the varieties pauciflorum or melananthum. In their reflexed stipules these plants recall T. tridentatum var. polyodon Jepson, but the plants in question have entire calyx-teeth, whereas the latter form has dentate calyx-teeth.

On account of the edibility and abundance of Trifolium variegatum its green herbage was an important food resource for the Pomo and other native tribes. In Ukiah Valley, it is called Sour Clover.

Locs.—Coastal S. Cal.: Mesa Grande, San Diego Co., *E. Ferguson* 88; Palm Cañon of San Ysidro, *Jepson* 8803; Palomar, *Jepson* 1521; Hemet Valley, San Jacinto Mts., *Clary* 977; Highland, San Bernardino Valley, *Parish* 2290. Mohave Desert: Providence Mts., *Munz* 4020. Coast Ranges: San Luis Obispo Valley, *Summers* (stipules reflexed); Stanford, *C. F. Baker;* Mt. Diablo, *Jepson* 13,711; Fish Ranch, Berkeley Hills, *Jepson* 13,707; Alderney, Marin Co., *Jepson* 8275; Guerneville, *E. Ferguson* 240; Yountville, Napa Valley, *Jepson* 13,706; Calistoga, *Jepson* 9177; Willits, Mendocino Co., *Jepson* 2482, 2487; Sherwood Valley, Mendocino Co., *Jepson* 1845; Eureka, *Tracy* 2963; Paskenta, sw. Tehama Co., *Jepson* 16,325. Great Valley: Merced, *J. T. Howell* 4171; Vacaville, *Jepson* 13,741; Oroville, *Heller* 10,734. Sierra Nevada: Fresno Flats, Madera Co., *Jepson* 12,838; Angels Camp, Calaveras Co., *Jepson* 10,428; Folsom, ne. Sacramento Co., *Jepson* 15,746; Honey Lake Valley, *Davy* 3361; Morleys sta., se. Shasta Co., *Baker & Nutting*.

Var. **pauciflorum** McDer. Dwarf, caespitose or the stems short and slender (1 to 6 inches long); leaflets very small; heads 1 to 7-flowered, small (2 to 3 lines long); corolla purplish; involucre 1 to 4-lobed, the lobes 3 to 5-toothed.—Valleys and mountains, 200 to 7500 feet.

Locs.—Mesa Grande, San Diego Co., *E. Ferguson* 113; Vandeventer, Santa Rosa Mts., *Jepson* 1427; Santa Ana River, San Bernardino Valley, *Parish* 1880; Rock Creek, San Gabriel Mts., *Peirson* 2417; Pacific Grove, *Heller* 6722 (stipules somewhat reflexed); St. Helena, *Jepson* 6235; Quartz Valley, Siskiyou Co., *Butler* 378; Snow Creek trail, Yosemite, *Jepson* 4384; Willows Sprs. sta., n. Amador Co., *Jepson* 15,235; Hot Sprs. Valley, Lassen Peak, *Jepson* 4075a.

Var. **trilobatum** Jepson. Slender, 4 to 8 inches high, sparsely branched at the base; margin of stipules laciniate; petioles slender, 1⅕ to 2 inches long; leaflets lanceolate, acute at each end or often remarkably trilobate at apex; heads on long slender peduncles; lobes of involucre deeply and laciniately toothed; flowers long; corolla dark purple, cream-color at the tips; calyx teeth slender, acute, generally purple-tinted.—Marysville Buttes.

Var. **melananthum** Greene. Leaflets large, oblanceolate to oblong or obovate, obtuse, ½ to 1 inch long; heads ¾ to 1⅛ inches broad, large-flowered, showy; involucres small; calyx-teeth pungent and purple-tipped.—Low valleys or montane valleys, 10 to 6000 feet: widely distributed.

Locs.—Coast Ranges: Santa Margarita, *Jepson* 11,967; Pacific Grove, *Tidestrom;* West Berkeley, *Jepson* 13,709. Tehachapi Mts.: Tehachapi, *Heller* 7821. Sierra Nevada: Table Mt., Fresno Co., *Jepson* 15,118; Guadalupe Mts., Mariposa Co., *Jepson* 10,732; Mt. Bullion, Mariposa Co., *Jepson* 10,720; Dry Creek hills, n. of Ione, *Jepson* 15,224; Penn Valley, Nevada Co., *Jepson* 13,710; Oroville, *Heller* 11,236.

Refs.—TRIFOLIUM VARIEGATUM Nutt.; T. & G. Fl. 1:317 (1838), type loc. Willamette River, Ore., *Nuttall;* McDer. N. Am. Sp. Trifolium 63, pls. 21, 22 (1910); Jepson, Fl. W. Mid. Cal. 308 (1901), ed. 2, 224 (1911), Man. 539 (1925). Var. PAUCIFLORUM McDer. l.c. 67, pls. 23, 24; Jepson, Fl. W. Mid. Cal. ed. 2, 225 (1911), Man. 539. *T. pauciflorum* Nutt.; T. & G. Fl. 1:319

(1838), type loc. Willamette River, Ore., *Nuttall*. *T. phaeocephalum* Greene, Pitt. 3:216 (1897), type loc. Sierra Nevada foothills (Butte Co., *R. M. Austin*). *T. variegatum* var. *pauciflorum* f. *phaeocephalum* McDer. l.c. 78, pl. 27. *T. geminiflorum* Greene, Pitt. 3:216, type loc. Lassen Peak, *R. M. Austin*. Var. TRILOBATUM Jepson; McDer. l.c. 73, pl. 25; Jepson, Fl. W. Mid. Cal. ed. 2, 225 (1911), Man. 539 (1925). *T. trilobatum* Jepson, Bull. Torr. Club 18:322 (1891), type loc. Marysville Buttes, *Jepson*. *T. calophyllum* Greene, Pitt. 3:213 (1897), type loc. "Kern Co. and southwards". Var. MELANANTHUM Greene, Fl. Fr. 29 (1891); McDer. l.c. 74; Jepson, Fl. W. Mid. Cal. ed. 2, 225 (1911), Man. 540 (1925). *T. melananthum* H. & A. Bot. Beech. 331 (1840), type from Cal. *T. morleyanum* Greene, Erythea 3:47 (1895), type loc. Morleys sta., Modoc Co., *Baker & Nutting*. *T. variegatum* var. *melananthum* f. *morleyanum* McDer. l.c. 76, pl. 26. *T. variegatum* var. *major* Loja. Nuov. Giorn. Bot. Ital. 15:183 (1883), type from Cal. *T. variegatum* var. *melananthum* f. *major* McDer. l.c.; Jepson, Fl. W. Mid. Cal. ed. 2, l.c.

9. **T. oliganthum** Steud. LANKY CLOVER. Stems slender, sparsely leafy, 4 to 16 inches high, with long internodes and long peduncles; herbage light green, glabrous, or the stipules and involucres sparsely pubescent; leaflets linear to cuneate-oblong, serrate-setate to entire, 3 to 10 lines long; peduncles 1 to 3¾ inches long; heads very small (2½ to 3 lines high), 3 to 15-flowered; involucre small, divisions deeply laciniate and unequal; flowers 3 to 3½ lines long; calyx 10-nerved, the teeth broadly subulate, dark green; corolla lavender, white-tipped; keel purple; calyx-teeth broadly subulate, dark green; pods 2 or 3-seeded.

Wooded cañons and brush-covered slopes, 25 to 3500 feet: Coast Ranges from San Luis Obispo Co. to Lake and Humboldt Cos.; Sierra Nevada from Calaveras Co. to Butte Co. North to British Columbia. Not common. Mar.-June.

Locs.—Coast Ranges: San Luis Obispo, *Summers;* Stanford, *C. F. Baker* 549; Fish ranch, Berkeley Hills, *Jepson* 13,698; Ross Valley, Marin Co., *Jepson* 13,700; St. Helena, *Jepson* 13,697; Knights Valley, Sonoma Co., *Greene;* Knoxville grade to Lower Lake, *Jepson* 13,699; Long Valley, Mendocino Co., *Tracy* 5802; Phillipsville, Humboldt Co., *Tracy* 5438. Sierra Nevada: Calaveras Big Trees, *Drew;* Chico Creek, Butte Co., *Heller* 11,230.

Var. **trichocalyx** McDer. Peduncles and heads covered with a white pubescence; leaflets obcordate or rhombic, 1½ to 5 lines wide, 2 to 8 lines long.—Pacific Grove.

Refs.—TRIFOLIUM OLIGANTHUM Steud. Nom. ed. 2, 2:707 (1841). McDer. N. Am. Sp. Trifolium 78, pls. 28–30 (1910); Jepson, Fl. W. Mid. Cal. 308 (1901), ed. 2, 225 (1911), Man. 540 (1925). *T. pauciflorum* Nutt.; T. & G. Fl. 1:319 (1838), type loc. "higher plains of the Oregon", *Nuttall;* not T. pauciflorum Urv. (1822). *T. oliganthum* var. *sonomense* Greene, Man. Reg. S. F. Bay 97 (1894), type loc. Knights Valley, Sonoma Co. *T. oliganthum* f. *sonomense* McDer. l.c. 84; Jepson, Fl. W. Mid. Cal. ed. 2, l.c. *T. triflorum* Greene, Pitt. 1:5 (1887), type loc. Mt. Diablo, *Curran*. *T. filipes* Greene, l.c. 66, type loc. Berkeley Hills, *Greene*. *T. hexanthum* Greene, Muhl. 2:215 (1906), above Pollasky, Madera Co., *Heller* 8145. Var. TRICHOCALYX McDer. l.c. pl. 31; Jepson, Fl. W. Mid. Cal. ed. 2, l.c. Man. l.c. *T. trichocalyx* Hel. Muhl. 1:55 (1904), type loc. Pacific Grove, *Heller* 6721.

10. **T. monanthum** Gray. CARPET CLOVER. Stems slender, erect or decumbent, 1 to 4 inches high; herbage sparingly villous with long scattered hairs or glabrous; leaflets obovate to oblanceolate, mostly retuse, sparingly toothed, 1 to 4 lines long; stipules sheath-like, subscarious, lanceolate, entire or nearly so; heads 1 to 4-flowered; involucre very small, 2 or 3-parted and often unilateral, the lobes bifid; calyx 1 to 2 lines long, its teeth subulate, shortly acuminate, thin; corolla white or sometimes lavender, 4 to 6 lines long; pods 1 to 3-seeded.

Moist meadows and springy places, forming mat-like colonies, 5000 to 11,500 feet: high mountains of coastal Southern California; Sierra Nevada from Tulare Co. to Plumas Co.; White Mts. Western Nevada. June-Aug.

Locs.—Ontario Ridge, San Gabriel Mts., *Peirson* 92; Mt. Pinos, Ventura Co., *Hall* 6526; Upper Funston Mdw., Chagoopah plateau, Kern Cañon, *Jepson* 5011; Mt. Silliman, *Jepson* 741; Sonora Pass, *A. L. Grant* 273; Plumas Co., *R. M. Austin*. White Mts.: North Fork Crooked Creek, *Jepson* 7274; Sheep Mt., *Jepson* 7336.

Var. **parvum** McDer. Stems many from the base, diffuse or decumbent, 4 to 12 inches high, herbage conspicuously pubescent; stipules entire or with few teeth; heads 2 to 4-flowered; involucres very small, ⅕ to as long as the calyx-tube; calyx-teeth lanceolate-subulate, longer than in the species.—Sierra Nevada from Nevada Co. to Fresno Co., 3500 to 9000 feet: Donner Lake, *Sonne* 422; Kennedy Mdw., Middle Fork Stanislaus River, *Jepson* 6538; McClure Fork Merced River, *Jepson* 4429a; Huckleberry Creek, Huntington Lake, *Jepson* 13,067.

Var. **tenerum** Parish. Stems 4 to 12 inches high, rather conspicuously villous; leaflets oblanceolate, acute; stipules serrate; heads mostly 3 to 6-flowered; involucral divisions laciniate almost to the base, equaling or slightly exceeding the calyx-tube; calyx-teeth lanceolate-subulate. —Sandy banks of streams in the mountains, 6000 to 7000 feet: Fresno Co. to Tulare Co.: Marble Fork Kaweah River, *Jepson* 732; Bench Mdw., Kaiser Ridge, Fresno Co., *Jepson* 13,228.

Var. **grantianum** Parish. Stems more slender than in the species; herbage glabrous, bright green; petioles 1½ to 4 times longer than the leaflets; leaflets oblanceolate, acute or obtuse, 4 to 8 lines long; stipules entire or sometimes shallowly toothed; flowers 5 to 7 lines long; calyx-teeth lanceolate-subulate.—High montane, San Jacinto, San Bernardino and San Gabriel mountains: Strawberry Valley, Mt. San Jacinto, *Jepson* 1303; Vivian Cañon, Mt. San Gorgonio, *Geo. B. Grant* 6343; Ontario Peak, *Johnston* 1550.

Var. **pusillum** Jepson comb. n. Plants ¼ to ¾ inch high; herbage glabrous; stipules rather deeply toothed; leaflets few-toothed; involucre irregularly and laciniately several-toothed, about 1 to 1½ lines in diameter; heads 1 or 2-flowered; flowers 2 to 2½ lines long; calyx about 1 line long, the teeth lanceolate-subulate, slightly shorter than the tube.—High montane, central Sierra Nevada, 5000 to 7400 feet: Silver Lake, Mono Co., *Peirson* 7573.

Refs.—TRIFOLIUM MONANTHUM Gray, Proc. Am. Acad. 6:523 (1866), type loc. Tuolumne Soda Sprs., *Brewer;* McDer. N. Am. Sp. Trifolium 96, pl. 35 (1910); Jepson, Man. 540, fig. 528 (1925). *T. monanthum* f. *spatiosum* McDer. l.c. 98, type loc. Independence Lake, Sierra Co., *Hall & Chandler* 613. Var. PARVUM McDer. l.c. 105, pl. 39; Jepson, Man. l.c. *T. pauciflorum* var. *parvum* Kell. Proc. Cal. Acad. 5:54 (1873), type loc. Cisco, Sierra Nevada. *T. parvum* Hel. Muhl. 1:114 (1905). *T. multicaule* Jones, Bull. Torr. Club 9:31 (1882), type loc. Soda Sprs. near Summit sta., Nevada Co., *Jones. T. monanthum* var. *parvum* f. *glabrifolium* McDer. l.c. 108, type loc. near Porcupine Flat, n. Mariposa Co., c. 8300 ft., *Hall & Babcock.* Var. TENERUM Parish, Bot. Gaz. 38:461 (1904); McDer. l.c. 100, pl. 36; Jepson, Man. l.c. *T. tenerum* Eastw. Bull. Torr. Club 29:81 (1902), type loc. Summit and Bearskin Mdws., Fresno Co., *Eastwood.* Var. GRANTIANUM Parish, Pl. World 20:220 (1917); Jepson, Man. l.c. *T. grantianum* Hel. Muhl. 1:136 (1906), type loc. Mt. San Gorgonio, San Bernardino Co., *Geo. B. Grant* 6343. *T. monanthum* var. *tenerum* f. *grantianum* McDer. l.c. 101, pls. 37, 38. *T. simulans* House, Bot. Gaz. 41:341, fig. 8 (1906), type loc. San Jacinto Mts., *Hall* 710. Var. PUSILLUM Jepson. *T. pusillum* Greene, Pitt. 3:217 (1897), type loc. "Yosemite Valley", *Parry.*

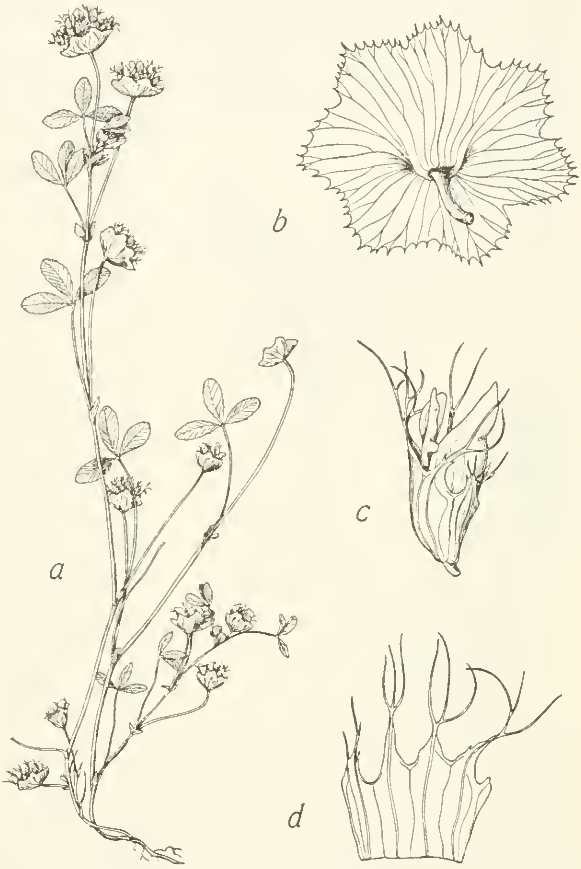

Fig. 195. TRIFOLIUM CYATHIFERUM Lindl. *a*, habit, × ½; *b*, involucre spread open, × 3; *c*, fl., × 3; *d*, calyx spread open, × 3.

11. **T. cyathiferum** Lindl. MOUNTAIN CLOVER. (Fig. 195.) Stems erect or decumbent, 3 to 12 inches long; herbage strictly glabrous; leaflets narrowly obovate to elliptic-oblong, 5 to 12 lines long; involucre membranous, bowl-shaped, 4 to 10 lines broad, the lobed margin unequally toothed; flowers 3 to 4 lines long, scarcely exceeding the involucre; calyx-teeth 1 to 3 times trichotomously forked; corolla white or light pink, soon turning brown; pods usually 2-seeded.

Valleys or hillsides, 50 to 6000 feet: Mt. Pinos; North Coast Ranges from Lake Co. to Siskiyou Co.; Sierra Nevada from Tulare Co. to Modoc Co. East to Nevada, north to Idaho and British Columbia. June-Aug.

Locs.—Mt. Pinos: Seymour Creek, *Peirson* 3217. North Coast Ranges: Gravelly Valley, n. Lake Co., *Jepson* 13,696; Ft. Bragg, *W. C. Mathews* 68; Sherwood to Laytonville, Mendocino Co., *Jepson* 2198; Buck Mt., Humboldt Co., *Tracy* 2827; Soldier Ridge, se. Trinity Co., *Jepson* 13,695; Log Lake, Shackelford Creek, w. Siskiyou Co., *Butler* 386. Sierra Nevada: Mineral King, Tulare Co., *T. Brandegee;* Coldstream, Placer Co., *Sonne;* Dixie Mts., Lassen Co., *Baker & Nutting;* Joseph Creek, Warner Mts., *L. S. Smith* 880.

Refs.—TRIFOLIUM CYATHIFERUM Lindl. Bot. Reg. sub t. 1070 (1827), type loc. Columbia River region, *Douglas;* Hook. Fl. Bor. Am. 1:133, t. 50 (1830); McDer. N. Am. Sp. Trifolium 115, pl. 42 (1910); Jepson, Fl. W. Mid. Cal. ed. 2, 226 (1911), Man. 540 (1925).

12. **T. barbigerum** Torr. COLONY CLOVER. (Fig. 196.) Stems several from the base, procumbent, spreading in a circle, 3 to 8 inches long; leaflets rhombic or deltoid to ovate-oblong, very obtuse to truncatish or retuse, setate-serrulate, 3 to 4 lines long; stipules ovate-lanceolate, scarious, the upper portion green; peduncles erect, slender, wiry, villous to glabrous; heads 3 to 6 lines high; involucre large (5 to 7 lines wide), shallowly bowl-shaped when young and almost enclosing the flowers, becoming nearly plane in age; calyx surpassing the corolla, its teeth plumose, setaceous, 1¼ to 2 times as long as tube, the lower tooth once or twice forked; corolla rose-red, the banner inflated; pods 2-seeded.

Low hills, in colonies, 10 to 2500 feet: near the coast from Del Norte Co. to Monterey Co.; Sierra Nevada foothills from Sacramento Co. to Calaveras Co. Apr.-June.

Locs.—Coastal region: Gasquets, Del Norte Co., *Howell* 1421; Hupa Mt., *Davy* 5684; Bald Mt., Humboldt Co., *Tracy* 6346; Eureka, *Blasdale;* Sherwood Valley, Mendocino Co., *Davy* 5137; Mendocino City, *Bolander* 4755; Fort Ross, *Heller* 6609; Pt. Reyes, *Jepson* 8323; Berkeley, *Greene;* Oakland Hills, *Jepson* 6866; San Francisco, *Jepson* 13,684; Lake San Andreas, San Mateo Co., *Elmer* 4859; Stanford, *C. F. Baker* 784; Alma, Santa Clara Co., *Heller* 7842; Santa Cruz, *Anderson;* Pacific Grove, *Heller* 6723. Sierra Nevada foothills: Folsom, ne. Sacramento Co., *Jepson* 15,742; Harmon Peak, Calaveras Co., *Davy* 1431.

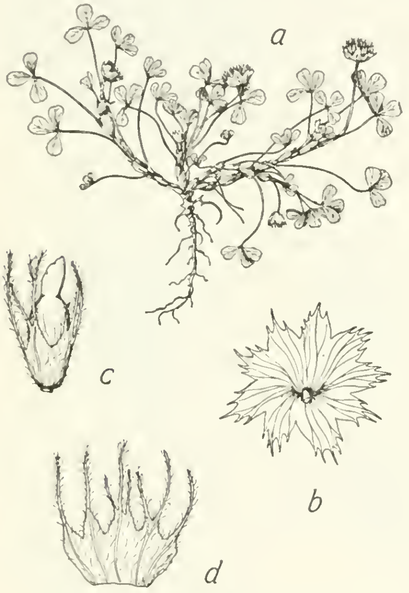

Fig. 196. TRIFOLIUM BARBIGERUM Torr. *a*, habit, × ½; *b*, involucre spread open, × 1½; *c*, fl., × 2; d, calyx spread open, × 2.

Var. **lilacinum** Jepson comb. n. Involucre 6 to 9 lines wide, deeply 8 to 10-lobed, ⅓ to ⅗ the length of the head; calyx conspicuously membranous, 2½ to 4 lines long, the teeth equaling the tube; corolla purple, white-tipped, 5 to 6 lines long.—Wet spots in valleys, mostly near or on the borders of the limits of distribution of the species in the Coast Ranges: Santa Margarita, San Luis Obispo Co., *Jepson* 11,967a; Dozier sta., Solano Co., *Jepson* 12,394; Eureka, *Tracy* 2964.

Refs.—TRIFOLIUM BARBIGERUM Torr. Pac. R. Rep. 4:79 (1857), type loc. San Francisco, *Bigelow;* McDer. N. Am. Sp. Trifolium 120, pl. 45 (1910); Jepson, Fl. W. Mid. Cal. 310 (1901), ed. 2, 225 (1911), Man. 540 (1925). Var. LILACINUM Jepson. *T. lilacinum* Greene, Proc. Acad. Phila. 47:547 (1896), type loc. South San Francisco, *Greene.*

13. **T. grayi** Loja. SONOMA CLOVER. (Fig. 197.) Stems erect or ascending, branching, 4 to 12 inches high; herbage villous-pubescent throughout; leaflets obovate, 4 to 7 lines long; stipules large, ovate, shortly laciniate, green on upper part, membranous below; heads large (9 to 13 lines wide); involucre saucer-shaped, villous-pubescent on both surfaces, shallowly 10 to 16-lobed, the lobes sometimes flabellate, incisely and equally aristate-toothed; flowers large, 5 to 8 lines long;

calyx-tube oblique, the upper side low; upper lobes with one bristle, lateral lobes commonly with 2 bristles each, the lowest lobe commonly with 3 bristles; corolla purple or lilac, much longer than the calyx.

Valley fields, 10 to 200 feet: Mendocino Co. to Santa Cruz Co. May.

Biol. note.—Trifolium grayi is a rather localized endemic of which the known stations are comparatively few. We believe it to be a mutant from T. barbigerum Torr. A similar mutant from that species is T. lilacinum Greene, which is evaluated on the basis of its morphological characters as a variety of T. barbigerum. The stem in T. grayi frequently exhibits a very remarkable habit in that it branches in one plane. There are, however, localities where the plant does not show this habit.

Locs.—Russian Gulch, Fort Bragg, *Davy* 6585; Mendocino City, *Bolander* 4781; Fulton, Sonoma Co., *Mason;* Mt. Olivet School, betw. Trenton and Mark West, *V. Blackney;* Petaluma, *Congdon;* Pt. Reyes, *Davy* 6727; Potrero bottoms, San Francisco, *Kellogg & Harford* 138; Santa Cruz, *Anderson.*

Refs.—TRIFOLIUM GRAYI Loja. Nuov. Giorn. Bot. Ital. 15:189, t. 3 (1883), resting upon the following. *T. barbigerum* var. *andrewsii* Gray, Proc. Am. Acad. 7:335 (1868), type collected by *Andrews,* the locality not stated; also cited, Mendocino City, *Bolander;* McDer. N. Am. Sp. Trifolium 124, pl. 46 (1910); Jepson, Fl. W. Mid. Cal. ed. 2, 226 (1911), Man. 541 (1925).

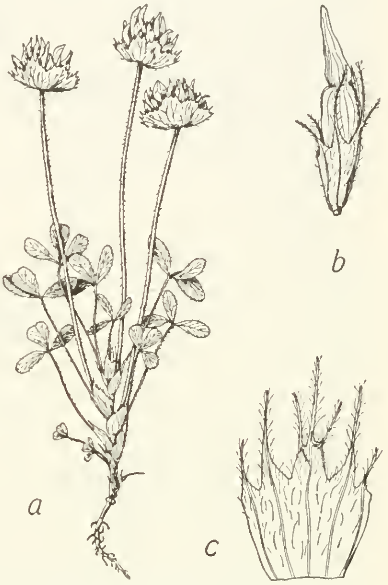

Fig. 197. TRIFOLIUM GRAYI Loja. *a,* habit, × ½; *b,* fl., × 2; *c,* calyx spread open, × 3.

14. **T. microdon** H. & A. SQUARE-HEAD CLOVER. Stems erect or decumbent, ⅓ to 2 feet high, the branches usually slender; herbage sparsely white-villous; leaflets broadly obcordate or oblanceolate, serrate-setate, 5 to 9 lines long; stipules broadly ovate or ovate-lanceolate, entire or toothed; heads 3 to 5 lines high; involucre deeply campanulate, becoming flattened at anthesis, 3 to 5 lines wide, 5 to 15-lobed, the lobes prominent, green, 3 to 7-toothed; flowers small (2 to 2½ lines long); calyx-teeth short, abruptly subulate, scarious and ciliate-margined; corolla white or turning light pink; pods 1-seeded.

Hillsides and valleys, 20 to 1200 feet: Coast Ranges from San Luis Obispo Co. to Del Norte Co.; Sacramento Valley. North to British Columbia. South America. Apr.-June.

Locs.—Coast Ranges: San Luis Obispo, *Summers* 180; Carmel, *Newlon* 106; Berkeley, *Jepson* 10,330a; Mt. Diablo, *Jepson* 13,661; Sherwood Valley, Mendocino Co., *Jepson* 1836; Buck Mt., Humboldt Co., *Tracy* 2781; Requa, Del Norte Co., *Davy.* Sacramento Valley: Vacaville, *Jepson* 13,662; Elk Grove, Sacramento Co., *Drew;* Olinda, Shasta Co., *Blankinship.*

Var. **pilosum** Eastw. Smaller; more or less woolly-pubescent.—San Nicolas Isl.

Refs.—TRIFOLIUM MICRODON H. & A. Bot. Misc. 3:180 (1833), type loc. Valparaiso, Chile, *Cuming* 747; Jepson, Fl. W. Mid. Cal. 308 (1901), ed. 2, 225 (1911), Man. 541, fig. 529 (1925); McDer. N. Am. Sp. Trifolium 111, pls. 40, 41 (1910). Var. PILOSUM Eastw. Proc. Cal. Acad. ser. 3, 1:100 (1898), type loc. San Nicolas Isl., *Trask;* McDer. l.c. 113; Jepson, Man. l.c.

15. **T. microcephalum** Pursh. MAIDEN CLOVER. Stems slender, sometimes stoutish, ascending, ⅓ to 2 feet high; herbage soft-pubescent to nearly glabrous; leaflets obcordate to oblanceolate, retuse, serrate, 3 to 6 lines long; stipules ovate, acuminate; involucre 7 to 10-lobed, the lobes lanceolate, entire with scarious web-like margins; heads small, compact, 3 to 5 lines high; flowers small (2 to 3 lines long); calyx shorter to slightly longer than corolla, the teeth entire, pungent, the margin below with a broad scarious border; corolla light pink or white; pods 1 or 2-seeded.

Hillsides and valleys, 20 to 7800 feet: common throughout cismontane California. North to British Columbia, east to Nevada. Mar.-May.

Locs.—S. Cal. (perhaps the most common Trifolium species): San Diego, *K. Brandegee;* Pigeon Pass, Riverside, *F. M. Reed* 746; San Bernardino foothills, *Parish;* Pacoima Cañon, San Gabriel Mts., *Peirson* 379; Newhall, *Jepson* 8924; Santa Catalina Isl. (Erythea 7:144); Prisoners Harbor, Santa Cruz Isl., *Jepson* 12,062; San Emigdio Cañon, *Davy* 1981. Coast Ranges: San Luis Obispo, *Summers;* Mt. St. Helena, *Jepson* 10,389; Mail Ridge, Humboldt Co., *Jepson* 1898; Bull Creek, Humboldt Co., *Jepson* 16,401; Quartz Valley, near Yreka, *Butler* 380. Great Valley: Vacaville, *Jepson* 13,683; Marysville Buttes, *Jepson* 13,682; Red Bluff, *Jepson* 16,352; Redding, *Blankinship.* Sierra Nevada: Kaweah River, *Woolsey;* Markwood Mdw., Fresno Co., *Jepson* 16,036; Huntington Lake, *E. Ferguson* 368a; Mono Mdws., South Fork San Joaquin River, *E. Ferguson* 419; Fresno Flats, *Jepson* 12,840; Guadalupe Mts., Mariposa Co., *Jepson* 10,731; Gwin Mine, Calaveras Co., *Jepson* 1776, 1791; Angels Camp, *Jepson* 10,425; Folsom, e. Sacramento Co., *Jepson* 15,741; Downieville, *Lemmon.*

Refs.—TRIFOLIUM MICROCEPHALUM Pursh, Fl. 478 (1814), type loc. Clarks River, *Lewis* (cf. Piper, Contrib. U. S. Nat. Herb. 11:363); McDer. N. Am. Sp. Trifolium 117, pl. 43 (1910); Jepson, Fl. W. Mid. Cal. 308 (1901), ed. 2, 226 (1911), Man. 541 (1925). *T. microcephalum* f. *velutinum* McDer. l.c. 120, pl. 44, type loc. Tehipite Valley, Fresno Co., *Hall & Chandler* 493.

16. **T. repens** L. White Clover. Stems creeping, bearing erect or ascending leaves and petioles; peduncles 2 to 9 inches high, much exceeding the leaves; herbage glabrous; leaflets broadly obcordate, 4 to 9 lines long; stipules ovate-lanceolate, acute; heads globose, 8 to 14 lines broad, the flowers completely reflexed in age; calyx 1½ to 3 lines long, its teeth subulate, shorter than the tube; corolla white or pale pinkish, 4 to 5 lines long.

Naturalized from Europe in moist meadows and waste places, 10 to 6500 feet; coastal region; lower Sacramento River; Sierra Nevada; Inyo Co. Apr.-Aug.

Locs.—Coastal region: Los Angeles (Erythea 1:59); Fortuna, Humboldt Co., *Jepson;* Eureka, *Tracy* 1946; Requa, *Davy* 5913. Lower Sacramento River: islands in sw. Sacramento Co. (Erythea 1:243). Sierra Nevada: Mineral, Tehama Co., *Jepson* 12,274; Tallac, Eldorado Co., *Jepson* 8086; Murphys, Calaveras Co. (Erythea 6:18); Angels Camp, Calaveras Co., *Jepson* 10,427; Cow Creek, Tuolumne Co., *Jepson* 6512; Yankee Hill, Tuolumne Co., *A. L. Grant* 756; Phoenix Lake, Sonora, *A. L. Grant* 37a. Inyo Co.: Wild Rose Spr., Panamint Range, *Jepson.*

Refs.—TRIFOLIUM REPENS L. Sp. Pl. 767 (1753), type from Europe; McDer. N. Am. Sp. Trifolium 290, pl. 122 (1910); Jepson, Fl. W. Mid. Cal. ed. 2, 227 (1911), Man. 544 (1925).

17. **T. hybridum** L. Alsike Clover. Stems stoutish, erect or ascending, ½ to 2¾ feet high; herbage sparsely pubescent, or subglabrous; leaflets large, ovate to orbicular, ¾ to 1½ inches long; stipules ovate-lanceolate, foliaceous near the margin, conspicuously veined; heads globose, 9 to 11 lines wide; pedicels pubescent; calyx sparsely pubescent with appressed hairs, or glabrous, or a little hairy in the sinuses; corolla light pink, 3½ to 4 lines long; pods 3 or 4-seeded.

Naturalized from Europe in valley flats, mountain meadows, or along creeks, 10 to 5800 feet: Humboldt, Siskiyou, Sierra and Tuolumne Cos. May-July.

Locs.—Eureka, *Tracy* 2108; Arcata, *Davy* 5601; Yreka, *Butler* 387; Pioneer sta., North Fork Yuba River, *Jepson* 16,803; Cow Creek, Tuolumne Co., *Jepson* 6510.

Refs.—TRIFOLIUM HYBRIDUM L. Sp. Pl. 766 (1753), type from Europe; McDer. N. Am. Sp. Trifolium 288, pl. 121 (1910); Jepson, Fl. W. Mid. Cal. ed. 2, 227 (1911), Man. 543 (1925).

18. **T. breweri** Wats. Forest Clover. Stems slender, erect or diffuse, 6 to 14 inches high; herbage pubescent, glaucous; leaflets obovate, notched or obtuse at apex, coarsely dentate, 2 to 7 lines long; heads small (3 to 4 lines high), loose; peduncles curved at apex in age and pedicels retrocurved so that the flowers at last stand almost horizontally (that is, at right angles to the straight portion of the peduncle); pedicels about 1½ lines long; flowers 2¼ to 3 lines long; calyx pubescent, its subulate teeth exceeding the tube; corolla cream-white to deep pink; pods pubescent, short-stipitate, 1-seeded.

Open forest slopes, 3000 to 6500 feet: Sierra Nevada from Madera Co. to Plumas and Butte Cos.; Trinity Co. to Siskiyou Co. North to southwestern Oregon. June-Aug.

Flower note.—The pedicels, which are about 1½ lines long, are soon retrocurved; the peduncles are also somewhat curved at apex; the result being that the flowers of a head, all turned in one direction, lie horizontally, the pedicels tending to cross the peduncle. The erect or ascending peduncle thus seems to support the head on its side. This clover is therefore quite unlike any other on account of this peculiarity of the head. The structure of the head in T. eriocephalum Nutt. and T. lemmonii Wats. is broadly similar but not identic.

Locs.—Fresno Big Trees, *Jepson* 15,974; Mariposa Big Trees, *Congdon;* Crane Creek, Yosemite, *Jepson* 4651; Wheelers, Tuolumne Co., *Chesnut & Drew;* Calaveras Big Trees, *Jepson* 10,077; Sierra Valley, *Lemmon;* Quincy, *Jepson* 4147; Colby, Butte Co., *R. M. Austin;* Big Mdws., Plumas Co., *R. M. Austin;* Silver Lake, Lassen Co., *Baker & Nutting;* Mt. Shasta, *F. W. Morse;* Coffee Creek, Salmon Mts., *Hall* 8536.

Refs. — TRIFOLIUM BREWERI Wats. Proc. Am. Acad. 11:131 (1876), type loc. Clark's (=Wawona), Mariposa Co.; McDer. N. Am. Sp. Trifolium 304, pl. 128 (1910), incorrectly illustrated from a spm. of T. gracilentum; Jepson, Fl. W. Mid. Cal. ed. 2, 226 (1911), Man. 542 (1925).

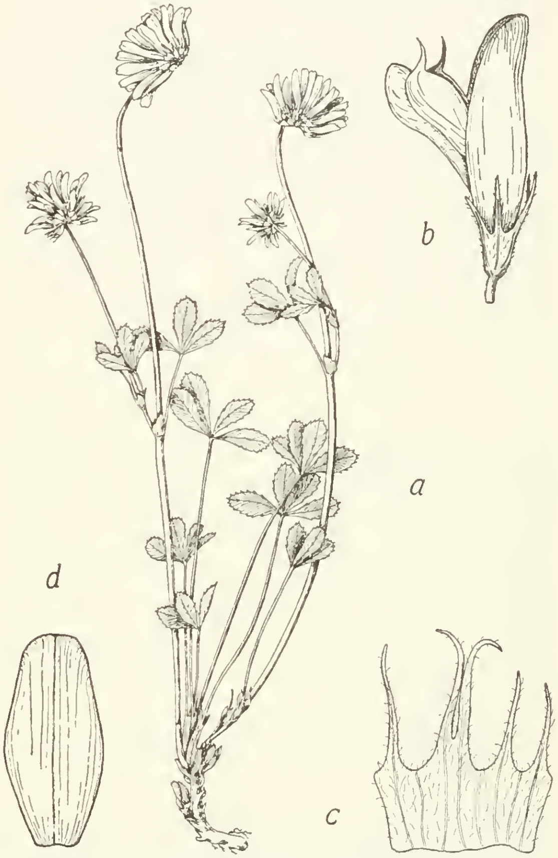

Fig. 198. TRIFOLIUM LEMMONII Wats. *a,* habit, × ½; *b,* fl., × 3; *c,* calyx spread open, × 6; *d,* banner × 3.

19. **T. lemmonii** Wats. POET'S CLOVER. (Fig. 198.) Stems rather slender, 6 to 8 inches high, from a thick root; leaflets obovate, obtuse, mucronate, coarsely toothed, 3 to 6 lines long; stipules ovate, acuminate, coarsely toothed; peduncles mostly terminal, 2 to 5 inches long, far exceeding the leaves; heads 10 to 15 lines broad; flowers numerous, 4 to 7 lines long; calyx pubescent, its tube 1 to 2 lines long, the teeth subulate, nearly equal, 1½ to 1¾ times as long as tube; corolla bright yellow, 5 lines long; banner somewhat concave above or a little hooded, rounded at apex and retuse, with a short point in the notch; wings abruptly lanceolate-acuminate at apex; ovary slightly pubescent, 2-ovuled.

Mountain valleys, 5000 to 7000 feet: eastern crests and slopes of the Sierra Nevada from Sierra Co. to Lassen Peak. June-July.

Tax. note.—Trifolium lemmonii Wats. is genetically very close to T. gymnocarpon Nutt. It is separable from it by habit and by quantitative rather than qualitative characters. T. lemmonii is taller with longer peduncles which must exceed the foliage; it has larger heads with more flowers which are slightly larger and more regularly reflexed. The petioles are longer, the leaflets somewhat broader, and the pubescence is in general somewhat shorter and less dense on the lower surfaces of the leaflets and on the calyces and ovaries, than is the case in T. gymnocarpon.

Locs.—Dog Valley, e. Sierra Co., *Sonne;* Sierra Valley, *Lemmon.*

Refs.—TRIFOLIUM LEMMONII Wats. Proc. Am. Acad. 11:127 (1876), type loc. Lassen Peak, *Lemmon;* Jepson, Man. 545 (1925). *T. gymnocarpon* var. *lemmonii* McDer. N. Am. Sp. Trifolium 194, pl. 78 (1910).

20. **T. eriocephalum** Nutt. Woolly-head Clover. Stems erect or decumbent at base, ½ to 1¼ feet high; herbage villous with spreading hairs, or rarely glabrous; leaflets narrowly oblong or sometimes broader, serrulate, ½ to 2 inches long; stipules long and narrow (¾ to 1½ inches long), nearly entire; peduncles 1½ to 6 inches long, becoming recurved; heads dense, globose, slightly spicate, ½ to 1 inch broad; flowers early reflexed, 4 to 6 lines long; calyx-teeth filiform, plumose, lax, ⅔ the length of the petals; corolla dull yellow; pods long-hairy towards the apex, 1 or 2-seeded.

Grassy slopes or valleys, 2500 to 6000 feet: Humboldt Co. to Siskiyou and Shasta Cos. North to Washington and Idaho, east to Colorado. June-Aug.

Locs.—Mail Ridge, s. Humboldt Co., *Jepson* 1894; Van Duzen River valley near Buck Mt., *Tracy* 2759; Kneeland, Humboldt Co., *Chesnut & Drew;* Mad River near Deer Creek, *Blasdale;* Sulphur Camp, se. Trinity Co., *Cronemiller* 583; Quartz Valley, near Yreka, *Butler* 379; Goosenest foothills, e. Siskiyou Co., *Butler* 918; Burney Valley, ne. Shasta Co., *Baker & Nutting.*

Var. **butleri** Jepson var. n. Plants reduced, 6 to 10 inches high; leaflets villous-pubescent beneath, 6 to 12 lines long, the margins minutely denticulate or setate or entire; heads smaller, 7 to 9 lines wide; flowers 4 to 5 lines long.—(Plantae reductae, unc. 6–10 altae; foliola subtus villoso-pubescentia, marginibus minute denticulatis, setosis vel integris, lin. 6–12 longa; capitula parviora, lin. 7–9 lata; flores lin. 4–5 longi.)—Montane, 5400 to 6500 feet: Siskiyou Co. (Log Lake, Shackelford Creek, *Butler* 384, type; Marble Mt., *Chandler* 1712).

Refs.—Trifolium eriocephalum Nutt.; T. & G. Fl. 1:313 (1838), type loc. Willamette River, *Nuttall;* McDer. N. Am. Sp. Trifolium 237, pls. 96, 97 (1910); Jepson, Man. 546, fig. 537 (1925). *T. scorpioides* Blasdale, Erythea 4:187 (1896), type loc. Mad River near crossing of Hy-am-pum trail, *Blasdale & Howe. T. eriocephalum* var. *harneyense* McDer. l.c. 243, pl. 99; Jepson, Man. 547, as to Cal. plants. Var. butleri Jepson.

21. **T. longipes** Nutt. Summer Clover. Stems slender, erect or ascending, 2 to 12 inches high, arising from a branched woody root-crown; stems usually glabrous, the leaflets and calyx sparingly villous; leaflets narrowly lanceolate to oblong, obovate or oblanceolate, serrulate or fimbriate, ⅓ to 1½ inches long; stipules ovate-lanceolate, entire or toothed; peduncles (1 or) 2½ to 4½ inches long, remaining erect; heads broadly (or roundish) ovate, rather dense, 7 to 10 lines high; calyx-teeth subulate-filiform, straight, more or less hairy, slightly shorter than the corolla; corolla 5 to 6 lines long, yellowish-white or tinged with purple; banner often long-acuminate; ovules 2 to 4; pods oblong to obovate, truncate, villous at apex, 2 to 4-seeded.

Montane meadows and valleys, 6500 to 8500 feet: Sierra Nevada from Tulare Co. to Shasta and Modoc Cos.; North Coast Ranges from Mt. Sanhedrin to the Yollo Bolly Mts. North to Canada, east to the Rocky Mts. June-Aug.

Locs.—Sierra Nevada: Long Mdw., Golden Trout Creek, Tulare Co., *Jepson* 4960 (1 to 2½ inches high, representing a high altitude form, 7000 to 8000 feet, with leaflets varying from sub-rotund to linear—sometimes on the same plant—and with short peduncles; other plants from the same altitudes are intermediate towards the usual form); Belle Mdw., Tuolumne Co., *Jepson* 6485; Deadman Creek, Sonora Pass, *A. L. Grant* 294; Silver Valley, Alpine Co., *Jepson* 10,146; Summit sta., Nevada Co., *Jepson* 13,693; Lassen Peak, *Chesnut & Drew;* Twin Lakes, se. Shasta Co., *Jepson* 4113; Martin Sprs., Eagle Lake, *Brown & Wieslander* 59; Egg Lake, sw. Modoc Co., *M. S. Baker;* Jess Valley, Warner Mts., *L. S. Smith* 792; Pine Creek, Warner Mts., *L. S. Smith* 968; Goose Valley, n. Modoc Co., *M. S. Baker.* North Coast Ranges: Mt. Hull, n. Lake Co.; Soldiers Ridge, se. Trinity Co., *Jepson* 13,694; Shackelford Creek, w. Siskiyou Co., *Butler* 1507.

The varieties named below are incomplete segregations (that is they represent merely extremes of variability) and are poorly established geographically.

Var. **elmeri** McDer. Stouter, 1½ to 2 feet high, with a combination of large leaves and long peduncles; leaflets linear-oblong, 1½ to 2¾ inches long; peduncles 5 to 6 inches long.—South Fork Trinity River. This form is no more common than plants (referred to the species) with large leaves in combination with peduncles of the usual length or with long peduncles and leaves of the usual length.

Var. **hansenii** Jepson comb. n. Dwarf 2 to 6 inches high; stems very slender; leaflets small, variable in shape; heads 3 to 5 lines wide; calyx glabrous.—High montane (8000 feet) in Amador Co.

Var. **nevadense** Jepson var. n. Leaflets narrow, the lower lanceolate, acute, the upper linear-acuminate, 2 to 2¾ inches long; heads 6 to 8 lines high, often longer than broad, and more or less flat-topped; flowers pale; calyx-teeth nearly equaling corolla.—(Foliola angusta, inferiora lanceolata, acuta, superiora linearia, acuminata, unc. 2–2¾ longa; capitula lin. 6–8 alta, saepe quam lata longiora, ad apicem plus minusve plana; flores pallidi; calycis dentes corollam aequantes.)—Nevada Co. (Truckee, *Michener*, type; Kneeland, *Sonne*). Recognizable by the characteristic upper leaflets and heads, it intergrades freely with the species in the same district.

Var. **atrorubens** Jepson comb. n. Stems slender, erect or often decumbent at base; heads ovate, 8 to 9 lines wide; calyx-teeth densely white-villous; corollas dark purple with lighter keel.—Wet meadows, 6500 to 8200 feet: San Bernardino Mts. (Bluff Lake, *Munz* 10,490; Bear Valley, *Parish* 3113); San Jacinto Mts. (Tahquitz Valley, *Hall* 2365).

Var. **shastense** Jepson comb. n. Leaflets lanceolate to linear-lanceolate, 1½ to 2 inches long, commonly 1 to 2 lines wide; peduncles slender, lax, 2½ to 8 inches long; banner and wings usually long-acuminate.—Siskiyou and Del Norte Cos.: Ash Creek, Mt. Shasta, *M. S. Baker;* Mt. Eddy, *Lemmon;* North Fork Smith River, *Doris Kildale.*

Refs.—TRIFOLIUM LONGIPES Nutt.; T. & G. Fl. 1:314 (1838), type loc. Rocky Mts., *Nuttall;* McDer. N. Am. Sp. Trifolium 246, pls. 100, 101 (1910); Jepson, Man. 547 (1925). Var. ELMERI McDer. l.c. 253, pls. 104, 105; Jepson, Man. l.c. *T. elmeri* Greene, Pitt. 3:223 (1897), type loc. South Fork Trinity River, *Chesnut & Drew. T. plumosum* Drew, Bull. Torr. Club 16:149 (1889), type loc. South Fork Trinity River, *Chesnut & Drew* (not T. plumosum Dougl. 1830). Var. HANSENII Jepson. *T. hansenii* Greene, Erythea 3:17 (1895), type loc. Silver Lake, Amador Co., *Hansen* 745. *T. longipes* f. *hansenii* McDer. l.c. 250. Var. NEVADENSE Jepson. Var. ATRORUBENS Jepson. *T. rusbyi* var. *atrorubens* Greene, Erythea 4:66 (1896), type loc. Bluff Lake, *Parish* 3745. *T. rusbyi* Greene, Pitt. 1:5 (1887), in part. *T. atrorubens* House, Bot. Gaz. 41:336 (1906). *T. longipes* var. *elmeri* f. *atrorubens* McDer. l.c. 256. Var. SHASTENSE Jepson. *T. shastense* House, Bot. Gaz. 41:336 (1906), type loc. Mt. Shasta, *H. E. Brown* 362.

22. **T. macrocephalum** Poir. BIG-HEAD CLOVER. Stem stout, simple, 4 to 9 inches high; herbage somewhat villous; leaflets 4 to 9, cuneate-oblong to obovate, obtuse, serrulate, mucronate, 3 to 8 lines long; stipules large, ovate-oblong, sparsely serrate; heads mostly terminal, globose-ovate, 1¼ to 1¾ inches wide; calyx 6 to 8 lines long, the teeth filiform, plumose, 3 to 4 times as long as the tube; corolla ⅞ to 1⅛ inches long, purplish; ovary 6-ovuled; pods stipitate, usually 1-seeded.

Mountain valleys and plateaus, 2000 to 5000 feet: Sierra Co. to Modoc, Shasta and Siskiyou Cos. East to Nevada, north to British Columbia. Rather rare. Apr.-June.

Locs.—Sierra Valley, *Lemmon;* Jess Valley, Warner Mts., *L. S. Smith* 795; Edgewood, Siskiyou Co., *J. W. Kisling;* Yreka, *Butler* 639.

Refs.—TRIFOLIUM MACROCEPHALUM Poir.; Lam. Encycl. Suppl. 5:336 (1817); McDer. N. Am. Sp. Trifolium 196, pls. 79, 80 (1910); Jepson, Man. 544, fig. 534 (1925). *Lupinaster macrocephalus* Pursh, Fl. 479, t. 23 (1814), type loc. headwaters of the Missouri River, *Lewis. T. megacephalum* Nutt. Gen. 2:105 (1818), based on last.

23. **T. monoense** Greene. MONO CLOVER. Caespitose dwarf 2 to 3 inches high, the leaves and peduncles matted on the branching root-crown; herbage whitish-pubescent; leaflets narrow-oblanceolate, abruptly acute or acuminate, entire, 3 to 5 lines long; stipules membranous, conspicuously crowded on the ends of the root-crown branches; peduncles 1½ to 2¾ inches long, conspicuously exceeding the leaves, rarely shorter; heads 8 to 9 lines broad, a little broader than high; calyx-tube 1½ to 2 lines long, the filiform teeth densely hairy, 2 to 3½ lines long; corolla pink, barely exceeding the calyx; pods densely tomentose at apex, 1 or 2-seeded.

Gravelly sandy soil of alpine slopes or flats, 10,300 to 12,000 feet: White Mts., Mono Co. July.

Tax. note.—The genetic relation between Trifolium monoense and T. andersonii is so very close as to call in question the status of the former as a species. McDermott (N. Am. Sp. Trifolium, 185) treats it as forma monoense of T. andersonii. The shape of the leaflets of T. monoense is, however, distinctive and consistently different from the shape in T. andersonii; the leaflets are smaller, less densely pubescent above and have shorter petioles. The heads of T. monoense are smaller, the peduncles are longer (commonly conspicuously exceeding the foliage) and the flowers are slightly smaller than in the case of T. andersonii. The petals exceed the calyx by a less amount in T. monoense and the pubescence is shorter. Trifolium monoense is, further, a species of higher altitudes. It forms very close mats on the ground in the sagebrush association.

Locs.—Big Prospector Mdw., *Jepson* 7254; Sheep Mt., *Jepson* 7331; McAfee Mdw., *Duran* 2826.

Refs.—Trifolium monoense Greene, Erythea 2:181 (1894), type loc. White Mts., *Shockley* 460; Jepson, Man. 544 (1925). *T. andersonii* f. *monoense* McDer. N. Am. Sp. Trifolium 185, pl. 73 (1910).

24. **T. andersonii** Gray. Range Clover. Caespitose dwarf 2 to 4 inches high, forming dense leafy tufts or mats on the stout root-crown; branches of the root-crown sheathed with membranous stipules; herbage densely silky- or rusty-villous; leaflets obovate to oblanceolate, 4 to 7 (or 11) lines long, abruptly short-acute or mucronate, entire or nearly so; peduncles mostly axillary, shorter than the leaves; heads subglobose, ¾ to 1¼ inches broad, subtended by a scarious vestige of an involucre; flowers 6 to 8 lines long; calyx-teeth filiform, plumose, a little shorter than the petals; corolla purplish; pods tomentose, about 5-ovuled, 1 or 2-seeded.

Sandy soil of plains or flats in the mountains, 3500 to 8000 feet: Sierra Co. to Shasta and Modoc Cos. East to western Nevada. June-July.

Locs.—Sierra Valley, *Lemmon;* Susanville, *T. Brandegee;* Big Valley near Bieber, Lassen Co., *M. S. Baker;* Bear Creek, ne. Shasta Co.; Goose Lake Valley, *R. M. Austin* 254.

Refs.—Trifolium andersonii Gray, Proc. Am. Acad. 6:522 (1866), type loc. Carson City, Nev., *Anderson;* McDer. N. Am. Sp. Trifolium 183, pl. 72 (1910); Jepson, Man. 544 (1925).

25. **T. gymnocarpon** Nutt. Dwarf Clover. Caespitose dwarf 1 to 3 inches high, the leaves and peduncles arising from the shortly branched root-crown; herbage white-pubescent; leaflets 3 to 5, obovate to elliptic, markedly serrate, 4 to 6 lines long; stipules thin and scarious, forming conspicuous persistent sheaths to the branches of the root-crown; heads loosely few-flowered, surpassed by the leaves; calyx pubescent, its teeth lanceolate, about equaling the tube; corolla yellowish-white or reddish, 3½ to 4 lines long, 1½ to 2 times as long as the calyx; young ovaries densely tomentose; pods very short and thick, 1 or 2-seeded.

Plains, valleys and ridges, 5300 to 6300 feet: Plumas Co. to Modoc Co. East to Colorado.

Locs.—Madeline plains, Lassen Co., *C. C. Bruce* 2293; Cattle Pass, Mt. Bidwell, *L. S. Smith* 1156.

Refs.—Trifolium gymnocarpon Nutt.; T. & G. Fl. 1:320 (1838), type loc. Rocky Mts., *Nuttall;* McDer. N. Am. Sp. Trifolium 187, pls. 74–76 (1910); Jepson, Man. 545 (1925). *T. subcaulescens* Gray, Ives. Rep. 10 (1860), type loc. near Fort Defiance, Ariz. *T. plummerae* Wats. Bot. Cal. 2:440 (1880), type loc. Pyramid Lake, Nev., *Lemmon & Plummer. T. plummerae* Loja. Nuov. Giorn. Bot. Ital. 15:162 (1883), type loc. above Pyramid Lake, Nev., *Lemmon. T. gymnocarpon* f. *plummerae* McDer. l.c. 192, pl. 77.

26. **T. oreganum** Howell. Two-way Clover. Stems slender, 3 to 9 (or 12) inches high, these and the chiefly basal leaves in a dense tuft on the root-crown; herbage glabrous to glabrate; leaflets linear-lanceolate or oblanceolate to obovate, serrulate, mucronate, 3 to 11 (or 15) lines long; stipules ovate, acuminate, the upper ones toothed, the lower entire; peduncles 1¼ to 5½ inches long; heads a little spicate, ½ to 1¼ inches long; pedicels very short (½ line long); flowers 6 to 7 lines long, reflexed in age; calyx and especially the segments villous, the tube more or less glabrate; calyx-segments subulate, the longer twice as long as the tube; corolla pinkish or light red.

Moist slopes in open pine forest, 5000 to 6000 feet: Trinity and Humboldt Cos. to Shasta Co. North to Oregon, southeast to Arizona. Apr.-June.

Locs.—Horse Mt., Humboldt Co., *Tracy* 7608; Bullard Basin, Salmon Mts., *Hall* 8629; Lamoine, Shasta Co., *Blankinship.*

Refs.—Trifolium oreganum Howell, Erythea 1:110 (1893), type loc. Waldo, Ore., *Howell;* McDer. N. Am. Sp. Trifolium 257, pl. 106 (1910), Jepson, Man. 543 (1925). *T. rusbyi* Greene, Pitt. 1:5 (1887), type loc. n. Ariz., *Lemmon, Rusby* (in part). *T. oreganum* f. *rusbyi* McDer. l.c. 260, pl. 107.

27. **T. kingii** Wats. var. **productum** Jepson comb. n. Prong-horn Clover. Stems rather slender, ascending, 4 to 15 inches high; leaflets lanceolate to oblong-

lanceolate or ovate, acuminate, ½ to 1¼ (or 2) inches long, the lower rounded or obovate, spinulose-serrate, 2 to 5 lines long; stipules broadly lanceolate, entire, ¼ to ½ as long as the leaflets; heads slightly elongate, 5 to 7 lines long; flowers 5 to 6 lines long, early deflexed, the end of the rachis produced as a sterile simple or branched process 1 to 3 lines long; calyx-segments subulate or lanceolate, shorter or longer than the tube; corolla rose-color or purple; pods stipitate, 1 or 2-seeded.

Moist cañon bottoms, 5500 to 6500 feet: Tuolumne Co. to Siskiyou and Lassen Cos. East to Utah, north to Montana. June-Aug.

Variation note.—In the Californian representation of Trifolium kingii the rachis is usually conspicuously produced and branched, although sometimes it is little developed or scarcely obvious. The stipe is long, often exceeding the calyx and equaling the pod. The original T. kingii Wats., Watson's collection from the Wasatch Mountains, appears to be slightly different; certainly in the Utah material before us a produced rachis is not obvious and the pods are subsessile. The "home" of T. kingii is in the meadows of the upper Humboldt River according to Greene (Pitt. 3:222), by which is meant, we take it, the biological center of its distribution.

Locs.—Sonora Pass, *A. L. Grant* 442; Lassen Peak, *Chesnut & Drew;* Mt. Harkness, Plumas Co., *Jepson* 4120; Martin Sprs., Eagle Lake, *Brown & Wieslander* 18; Soldier Creek, Warner Mts., *L. S. Smith* 841; summit above Marble Valley, Siskiyou Co., *Butler* 377.

Refs.—TRIFOLIUM KINGII Wats. Bot. King 59 (1871), type loc. Parleys Park, Wasatch Mts., Utah, *Watson* 239. Var. PRODUCTUM Jepson. *T. productum* Greene, Erythea 2:181 (1894), "Mt. Shasta to Placer Co." *T. kingii* McDer. N. Am. Sp. Trifolium 281, pl. 119 (1910); Jepson, Man. 543, fig. 533 (1925), as to Californian plants.

28. **T. bolanderi** Gray. PARASOL CLOVER. Plants 4 to 9 inches high, the numerous stems decumbent or ascending, caespitose on the branched root-crown, sparsely leafy, the leaves mostly basal; leaflets obovate or somewhat rhomboidal, slightly serrulate, 3 to 8 lines long; lower leaflets broadly or fan-shaped obovate, 2 to 3 lines long; stipules foliaceous, broadly oblong, acute; peduncles slender, elongated, occasionally axillary, 2 to 5 inches long; heads small (5 to 6 lines long), the flowers relatively few, reflexed; calyx-teeth lanceolate, scarcely equaling the tube; corolla lavender; ovary 2-ovuled.

Mountain meadows, 7000 to 7100 feet: Sierra Nevada from Mariposa Co. to Fresno Co. June-July.

Locs.—This species is an endemic of narrow range and with only a few known localities within that range, namely: Westfalls Mdw., above Yosemite, *Kennedy* 3020; Peregoy Mdw., above Yosemite (Zoe 3:318); Clover Mdw., Madera Co., *Mainwaring* 505; Jackass Mdw., South Fork San Joaquin River, *A. L. Grant* 1338; North Fork Kings River, *Hall & Chandler* 424. The distribution altitudinally is also, apparently, within very narrow limits. Westfalls Meadow, the type locality, is at the head of Alder Creek, just off the Yosemite-Wawona road about three-fourths mile and directly on the (upper) Bridal Veil trail from that road. The elevation is 7100 feet. Although we here speak of this species as a narrow endemic, it is extremely close genetically to T. kingii Wats. and its full specific status may properly be questioned. In this treatment we are retaining it (although reluctantly) as a species, in contrast to T. kingii, on account of its larger number of lower (or juvenile) leaves and fewer-flowered heads.

Refs.—TRIFOLIUM BOLANDERI Gray, Proc. Am. Acad. 7:335 (1868), type loc. Westfalls Mdw. above Yosemite Valley, *Bolander;* McDer. N. Am. Sp. Trifolium 278, pl. 118 (1910); Jepson, Man. 544 (1925).

29. **T. howellii** Wats. CAÑON CLOVER. Stems stout, erect, nearly simple, 2 to 2¾ feet high; leaflets elliptic to elliptic-ovate, 1½ to 3 inches long; stipules large, foliaceous, ovate; peduncles usually slightly curved at base of head, 2½ to 3¾ inches long; heads ovate or oblong, ½ to ¾ inch long; flowers reflexed; calyx-tube ½ to 1 line long, the teeth subequal, subulate, 1 to 1¼ lines long; corolla white, 4 to 7 lines long; banner ovate to oblong, obtuse or truncate; pods stipitate, usually 1-seeded.

Springy places or damp thickets along streams in cañons, 4000 to 5000 feet: Humboldt Co. to Siskiyou Co. North to Oregon. July-Aug.

Locs.—Grouse Mt., Humboldt Co., *Tracy;* Pilot Creek, Humboldt Co., *Chesnut & Drew;* Shackelford Creek, Siskiyou Co., *Butler* 385.

Refs.—Trifolium howelli Wats. Proc. Am. Acad. 23:262 (1888), type loc. Siskiyou Mts., s. Ore., *Howell;* McDer. N. Am. Sp. Trifolium 265, pl. 110 (1910); Jepson, Man. 544 (1925).

30. **T. beckwithii** Brew. Plumas Clover. (Fig. 199.) Stems stout, mostly rather strictly erect, 4 to 12 inches high; herbage glabrous; leaflets narrowly to broadly oblong, often tapering towards apex, mostly obtuse, strikingly nerved, serrate, ¾ to 2½ inches long; stipules lanceolate to ovate, entire; peduncles stout, usually not reflexed at base of head; heads globose, ¾ to 1½ inches wide; flowers 6 to 8 lines long, the lower ones reflexed in age; calyx glabrous, 2½ to 3 lines long, its teeth linear-subulate, straight, equaling the tube, 1½ to 1⅔ lines long; corolla red; ovary 2 to 6-ovuled.

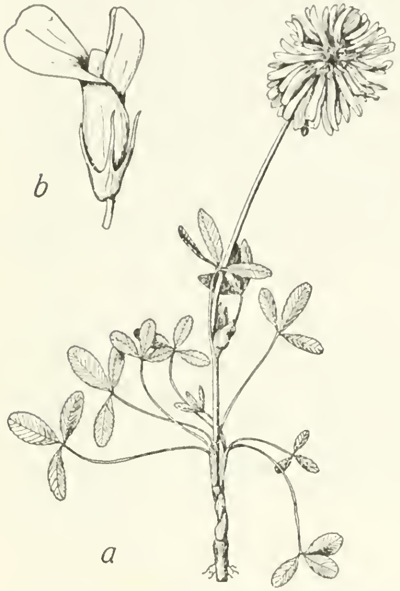

Fig. 199. Trifolium beckwithii Brew. *a*, habit, × ½; *b*, fl., × 2.

Mountain valleys and meadows, 4000 to 6000 feet: northern Sierra Nevada from Nevada Co. to Modoc Co. East to Nevada, north to eastern Oregon and southern Idaho. June-July.

Locs.—Donner Lake, *Sonne* 348; Sardine Valley, Nevada Co., *Sonne;* Dog Valley grade, Sierra Co., *L. S. Smith* 1601; Sierra Valley, *Lemmon;* Big Mdws., Plumas Co., *R. M. Austin* 233; Egg Lake, sw. Modoc Co., *M. S. Baker.*

Refs. — Trifolium beckwithii Brew.; Wats. Proc. Am. Acad. 11:128 (1876); McDer. N. Am. Sp. Trifolium 276, pl. 117 (1910); Jepson, Man. 543 (1925). *T. altissimum* T. & G. Pac. R. Rep. 2:120 (1855), type loc. Sierra Nevada; not T. altissimum Loisel. (1807).

31. **T. pratense** L. Red Clover. Stems several from the base, ½ to 2 feet high; herbage pubescent; leaflets large, ovate to elliptic, entire or crenulate, often with a whitish blotch near the middle, 1 to 1¾ inches long; stipules membranous, conspicuously veined; petioles 1 to 6 inches long, or the upper often shorter than the leaflets; heads round-ovate to conical, ¾ to 1 inch high, subtended by the sessile upper leaves; calyx-tube pubescent, conspicuously nerved, the teeth subulate; corolla deep pink or red; pod 2-seeded.

Naturalized from Europe, low moist valleys, or wet meadows in the mountains: Sierra Nevada, 1400 to 5000 feet, from Mariposa Co. to Siskiyou Co.; delta region of Great Valley and coastal region, 10 to 500 feet. June-July.

Locs.—Sierra Nevada: Yosemite Valley, *Jepson* 8378; Angels Camp, Calaveras Co., *Jepson* 10,426; Murphys, Calaveras Co. (Erythea 6:18); Blue Cañon, Placer Co., *H. A. Walker* 1335; Mineral, Tehama Co., *Jepson* 12,273; Fort Bidwell, Modoc Co., *Jepson* 7910. Great Valley: Tyler Isl., lower Sacramento River, *Jepson* 13,692. Siskiyou Co.: Dunsmuir, *Jepson* 6167; Sisson, *Jepson* 13,691. Coastal region: Los Angeles, *E. D. Palmer;* Fort Bragg, *W. C. Mathews* 83; Fortuna, Humboldt Co., *Jepson;* Eureka, *Tracy* 2987.

Refs.—Trifolium pratense L. Sp. Pl. 768 (1753), type from Italy; Jepson, Fl. W. Mid. Cal. 307 (1901), ed. 2, 227 (1911), Man. 546 (1925); McDer. N. Am. Sp. Trifolium 224, pl. 91 (1910).

Trifolium incarnatum L. Sp. Pl. 769 (1753), type from Italy. Crimson Clover. Annual; stems stout, erect or decumbent-ascending, ½ to 3 feet high; herbage villous; stipules broadly ovate-oblong, conspicuously veined; petioles usually 1 to 3 inches long; leaflets orbicular to obdeltoid, ½ to 1½ inches long; peduncles stout, 1 to 4 inches long; spikes cylindrical, 1 to 2½ inches long, about ½ inch wide; calyx silky-plumose, the tube conspicuously ribbed, about 2 lines long; teeth linear-subulate, 4 lines long, becoming rigid and somewhat spreading in fruit; corolla scarlet to deep red, equaling or exceeding the calyx; pod one-seeded.—Introduced from Europe and naturalized throughout North America, rare in California: Healdsburg, *M. Weidemann.* May-July.

32. **T. dubium** Sibth. SHAMROCK. Stems slender, 1 to many from base, erect or ascending, ½ to 1½ feet long, pubescent above; leaflets obovate or cuneate, denticulate, often emarginate, glabrous, 3 to 4 lines long, on very short petioles; heads small (3 lines broad), the rachis elongated; flowers very small, in age reflexed; calyx 1½ lines long, the teeth subulate, unequal, the longest about equaling the tube; corolla yellow, turning brown, 1½ to 2 lines long; pods 1-seeded.

Naturalized from Europe, in streets, pastures and waste lands of valleys, 10 to 2000 feet: Del Norte Co.; Humboldt Co.; Nevada Co.; Calaveras Co.; San Francisco Bay region. Apr.-June.

Locs.—Crescent City, *Davy* 5923; Arcata, *Davy* 5602; Eureka, *Chandler* 1127; Scotia, *Davy* 5529; Holmes Flat, betw. South Fork and Scotia, *Tracy* 4699; Nevada City; Angels Camp, *Davy;* San Francisco, *Agnes Erickson;* Berkeley, *Blasdale.*

Refs.—TRIFOLIUM DUBIUM Sibth. Fl. Oxon. 231 (1794), type from Europe; McDer. N. Am. Sp. Trifolium 306, pl. 129 (1910); Jepson, Man. 541 (1925).

33. **T. procumbens** L. HOP CLOVER. Stems slender, decumbent or ascending, 6 to 13 inches long, finely appressed-pubescent, the leaflets glabrous; leaflets elliptic or cuneate-obovate, often emarginate, 3 to 9 lines long, longer than the petioles; heads globose or a little elongate, 4 to 5 lines long; flowers in age reflexed; calyx about 1 line long, the teeth subulate, unequal; corolla bright yellow, about 3 lines long, the banner very broad; pods 1-seeded, stipitate.

Naturalized from Europe, sparingly established in roadways and lawns, 10 to 1500 feet: Humboldt Co. June.

Locs.—Betw. Korbel and Angels ranch, *Tracy* 4523 in 1914; betw. Eureka and Arcata, *Jepson* 1923 in 1902.

Refs.—TRIFOLIUM PROCUMBENS L. Sp. Pl. 772 (1753), type from Europe; McDer. N. Am. Sp. Trifolium 306 (1910); Jepson, Man. 541 (1925).

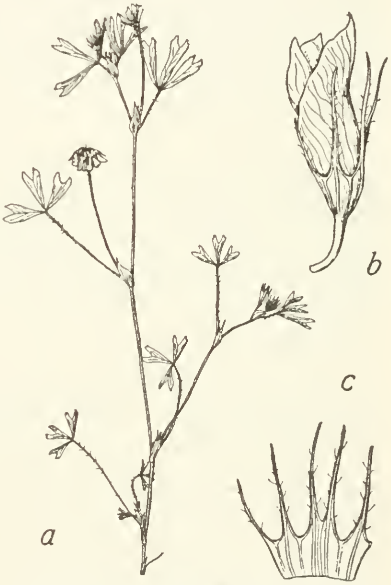

Fig. 200. TRIFOLIUM BIFIDUM Gray. *a,* habit, × ½; *b,* fl., × 5; *c,* calyx spread open, × 5.

34. **T. bifidum** Gray. PINOLE CLOVER. (Fig. 200.) Stems erect, very slender, branching, 7 to 17 inches high; stipules ovate-lanceolate, setaceously acuminate, entire; leaflets remarkably bifid, that is ⅓ to ½ their length, often with a prominent mucro in the notch, the lobes coarsely toothed at apex; leaflets of upper leaves 5 to 11 lines long; peduncles pubescent at base of heads; heads small, the flowers in age reflexed; calyx pubescent; corolla purple or pale pink; banner characteristically patterned by the peculiar venation.

Open hills and valleys, 100 to 1500 feet: coastal Southern California; Coast Ranges from Santa Clara Co. to Humboldt Co.; Sacramento Valley; Sierra Nevada foothills from Mariposa Co. to Eldorado Co. May-June.

Geog. note.—While widely distributed, Trifolium bifidum Gray is an infrequent species in number of individuals as compared with several other annual species such as T. gracilentum T. & G., T. fucatum Lindl., T. tridentatum Lindl. or T. microcephalum Pursh. We have no specimens from the San Joaquin Valley; and occurrence in Southern California and the South Coast Ranges is evidently rare.

Locs.—Coastal S. Cal.: Morgan sta., sw. Los Angeles Co. (Proc. S. Cal. Acad. 1:7). Coast Ranges: Los Gatos, *Heller* 7307; Woodside, San Mateo Co., *C. F. Baker* 743; Berkeley, *Tracy* 738; Rutherford, Napa Valley, *Chandler;* Hopland, Mendocino Co., *Tracy* 5551; Trinity River valley, Humboldt Co., *Tracy* 5992. Sacramento Valley: Vacaville, *Jepson* 13,702; Colusa Co., *K. Brandegee.* Sierra Nevada foothills: Mariposa, *Congdon;* Pilot Hill, Eldorado Co., *K. Brandegee.*

Var. **decipiens** Greene. Leaflets linear-cuneate to obcordate, entire or slightly emarginate at apex.—Santa Barbara Co. to Humboldt Co.; Sacramento Valley; northern Sierra Nevada foothills. North to Washington (Piper, Contrib. U. S. Nat. Herb. 11:361).

Variation note.—The variety decipiens Greene is mainly a leaf variation, although Greene characterized his variety further by its stouter stems and heads with more numerous flowers, as opposed to the slender stems and few-flowered heads of the species. We note in a series of specimens that few-flowered heads are likely to be associated with small and delicate plants, but that such plants may have leaflets which vary widely as to the depth of the apical notch. In general the association of robust habit with shallowly notched leaflets (that is, typical var. decipiens), and of delicate habit with deeply notched leaflets (that is, typical of the species), is more common than the opposite combinations, though individuals more or less intermediate may be common in a given locality. In the fields of Pope Valley, Napa Co., we have observed numerous plants with every gradation from deeply notched leaflets to obtuse leaflets but without definite association with stem thickness or number of flowers in the head (*Jepson, Crum* 1055). The number of specimens at hand of each form indicates that the species (except in the most extreme form) is nearly as common and widely distributed as the variety.

Locs.—Coastal region: Gaviota, Santa Barbara Co., *Eastwood;* San Luis Obispo, *Summers;* Pilarcitos, San Mateo Co., *Davy* 1019; Berkeley, *Davy* 6548; Buck Mt., Humboldt Co., *Tracy* 2780. Sacramento Valley: Wolfskill, nw. Solano Co., *Jepson* 10,403; Crane Creek, w. Tehama Co., *Jepson* 13,703; Red Bluff, *Jepson* 13,704. Northern Sierra Nevada foothills: Placerville, *K. Brandegee;* Morleys sta., Shasta Co., *M. S. Baker.*

Refs.—TRIFOLIUM BIFIDUM Gray, Proc. Am. Acad. 6:522 (1866), type loc. near Mt. Diablo, *Brewer;* House, Bot. Gaz. 41:334, fig. 2 (1906); McDer. N. Am. Sp. Trifolium 301, pl. 127 in part (1910); Jepson, Fl. W. Mid. Cal. 307 (1901), ed. 2, 226 (1911), Man. 541 (1925). Var. DECIPIENS Greene, Fl. Fr. 24 (1891), type loc. San Francisco "Bay district"; McDer. l.c. 302, pl. 127 in part; Jepson, Fl. W. Mid. Cal. 307 (1901), ed. 2, 226 (1911), Man. 542 (1925). *T. hallii* Howell, Fl. Nw. Am. 135 (1898) as to the Oregon plant, not T. & G. *T. greenei* House, Bot. Gaz. 41:334 (1906), renaming of variety.

35. **T. ciliolatum** Benth. Tree Clover. Stem stout, erect, fistulous, 1 to 2 feet high; herbage glabrous throughout; leaflets oblong or oblong-ovate, obtuse, entire to serrulate, ½ to 1½ inches long; stipules large, ovate-lanceolate, the margins scarious; heads conical, 3 to 7 lines high; flowers reflexed in age; rachis often projecting through the head as a sterile point 1 to 5 lines long; calyx-teeth remarkably ciliate; corolla pinkish-purple; banner inflated at base, tapering toward the apex; pods 1 or 2-seeded.

Plains, valleys and foothills, 50 to 5000 feet: throughout cismontane California. North to Washington. Apr.

Locs.—Coastal S. Cal.: Mesa Grande, San Diego Co., *E. Ferguson* 35; Lugonia, San Bernardino Valley, *Parish;* Pacoima Cañon, San Gabriel Mts., *Peirson* 378; Santa Catalina Isl. (Erythea 7:144); Prisoners Harbor, Santa Cruz Isl., *Jepson* 12,065; Santa Barbara, *Elmer* 3824. Coast Ranges: San Luis Obispo, *Summers* 168; Little Arthur Creek, w. of Gilroy, *Jepson* 9705a; Black Hills, Mt. Diablo, *Jepson* 10,689; Calistoga to Porter Creek, *Jepson* 9184; Mt. St. Helena, *Jepson* 10,368; South Mill Creek, Ukiah, *Jepson* 9276; Hydesville, Humboldt Co., *Tracy* 3720. Great Valley: Selma, *H. P. Kelley;* Lockeford, San Joaquin Co., *Jepson* 15,190; Vacaville, *Jepson* 13,668; Sutter City, *Jepson* 13,666; Red Bluff, *Blankinship;* Crane Creek, w. Tehama Co., *Jepson* 13,667. Sierra Nevada: Old Colony Mill, Marble Fork Kaweah River, *Jepson* 631; Bootjack, Mariposa Co., *Jepson* 12,780; Cathay Valley, Mariposa Co., *Jepson* 12,767; Guadalupe Mts., Mariposa Co., *Jepson* 10,734; Table Mt., Sonora, *Jepson* 6423; Yankee Hill, Tuolumne Co., *A. L. Grant* 754; Gwin Mine, Calaveras Co., *Jepson* 1801; Angels Camp, *Jepson* 10,423; Rock Creek, Butte Co., *Heller* 13,924.

Refs.—TRIFOLIUM CILIOLATUM Benth. Pl. Hartw. 304 (1848), type loc. Sacramento Valley, *Hartweg* 270; Jepson, Fl. W. Mid. Cal. 307 (1901). *T. ciliatum* Nutt. Jour. Acad. Phila. n. ser. 1:152 (1847), type loc. Los Angeles, *Gambel;* McDer. N. Am. Sp. Trifolium 292, pl. 123 (1910); Jepson, Fl. W. Mid. Cal. ed. 2, 226 (1911), Man. 542, fig. 530 (1925); not T. ciliatum Clarke (1813–1816). *T. ciliatum* var. *discolor* Loja. Nuov. Giorn. Bot. Ital. 15:146 (1883), type loc. "in montosis Californiae prope Sancta Inez", *E. Cooper.*

36. **T. gracilentum** T. & G. Pin-point Clover. Stems slender, erect, spreading or procumbent, 5 to 20 inches long; herbage glabrous; leaflets obovate, retuse at apex, 3 to 6 (or 9) lines long; stipules ovate-lanceolate; heads numerous, small, 3 to 5 lines long, with the flowers reflexed in age, the rachis projecting; calyx-teeth

subulate, entire, shorter than the reddish-purple to light pink corolla; pods 1 or 2-seeded.

Valleys and foothills, 50 to 2500 feet: coastal Southern California; Coast Ranges; Great Valley. North to Washington. Mar.-May.

Geog. note.—The prevailing form in central and northern California is the typical state of the species with the calyx much exceeded by the dark purple corolla. Though much less common southward, it extends to San Diego Co. The variety inconspicuum Fer., with pale corollas and long calyx-lobes, has a center of distribution from Los Angeles to San Diego and is in that region apparently more common than the species. While the combination of pale corollas and long calyx-lobes is the common one for the variety, forms with relatively short calyx-lobes also occur throughout its range.

Locs.—Coastal S. Cal.: Jacumba, San Diego Co., *T. Brandegee;* Cahuilla Valley, w. Riverside Co., *Jepson* 1474a; Banning, *Gilman;* San Bernardino, *Parish;* Purisima Hills, Santa Barbara Co., *Jepson* 12,651. Coast Ranges: Pacific Grove, *Heller* 6629; Mt. Hamilton, *Jepson* 4199; Corral Hollow, Mt. Hamilton Range, *Jepson* 9564; Mt. Diablo, *Jepson* 9858; Oakland Hills, *Jepson* 6865; Mt. Davidson, San Francisco, *Jepson* 10,355; Vallejo, *Blankinship.* Great Valley: Delano, Tulare Co., *Munz* 9010; Coalinga, *Jepson* 15,355; Vacaville, *Jepson,* 13,685; Mills sta., n. Sacramento Co., *Jepson* 15,733; Sutter City, *Jepson* 13,688; Red Bluff, *Blankinship.*

Var. **inconspicuum** Fer. Smaller but like the species in habit; stems 4 inches high or less; flowers light purple to white; calyx nearly equaling to slightly exceeding the corolla; banner broader.—Coastal Southern California; occasional in Coast Ranges and Great Valley.

Locs.—San Diego, *K. Brandegee;* Banning, *Gilman* 14; Highland, San Bernardino Valley, *Parish* 4684; Glendora, Los Angeles Co., *E. D. Palmer;* San Fernando, *Jepson* 8927; Bakersfield, *Jepson* 6767; Lone Willows road sta., Fresno Co., *Jepson* 11,585; San Luis Obispo, *Jones* 2675; Little Arthur Creek, w. of Gilroy, *Jepson* 9717; Santa Rosa Creek, Sonoma Co., *Bolander* 3804.

Var. **palmeri** McDer. Leaflets large (½ to 1¼ inches long), lanceolate, abruptly acute at tip, the margins serrate-setate; corolla purple to pink.—Santa Catalina Isl. (Erythea 7:144); San Clemente Isl., *Nevin.* South Guadalupe Isl., Lower California.

Refs.—TRIFOLIUM GRACILENTUM T. & G. Fl. 1:316 (1838), type from Cal., *Douglas;* McDer. N. Am. Sp. Trifolium 295, pl. 124 (1910); Jepson, Fl. W. Mid. Cal. 307 (1901), ed. 2, 226 (1911), Man. 542, fig. 531 (1925). *T. denudatum* Nutt. Jour. Acad. Phila. n. ser. 1:152 (1848), type loc. "pueblo de los Angeles", *Gambel. T. exile* Greene, Pitt. 1:6 (1887), type loc. Santa Cruz Isl., *Greene. T. gracilentum* var. *exile* Kennedy, Muhl. 5:10 (1909). *T. gracilentum* var. *palmeri* f. *exile* McDer. l.c. 300. *T. gracilentum* var. *reductum* Parish, Bot. Gaz. 65:338 (1918), type loc. summit of Pilot Knob, Mohave Desert, *Parish* 10,160. Var. INCONSPICUUM Fer. Zoe 4:380 (1894), type loc. San Bernardino, *Parish* 2647; McDer. l.c. 297, pl. 125; Jepson, Fl. W. Mid. Cal. 226 (1911), Man. 542 (1925). *T. inconspicuum* Hel. Muhl. 1:135 (1906). Var. PALMERI McDer. l.c. 300. *T. palmeri* Wats. Proc. Am. Acad. 11:132 (1876), type loc. Guadalupe Isl., *Palmer.*

37. **T. macraei** H. & A. CHILE CLOVER. Stems several from the base, spreading, stout or often wiry, 4 to 12 inches long; herbage softly pubescent throughout; leaflets obovate, 4 to 6 lines long; heads 4 to 6 lines high, borne in pairs, sessile or shortly pedunculate, subtended by the broadly ovate stipules and sessile leaves; calyx-teeth plumose, linear-subulate to filiform, dilated at the base; corolla purple, as long or longer than the plumose calyx; pods 1-seeded.

Along the immediate coast, 5 to 50 feet: Del Norte Co. to Monterey Co.; Santa Catalina Isl. Chile. Apr.

Locs.—Lake Earle, Del Norte Co., *Davy;* Eureka, *Chandler* 1148; Point Reyes, *Jepson* 8311; Corte Madera, Marin Co., *Heller;* North Berkeley Hills, *Tracy* 737; San Bruno, *Michener & Bioletti;* Pilarcitos, San Mateo Co., *Davy* 1016; Mt. Hamilton, *Elmer* 4673; Del Monte, Monterey, *Heller* 6664; Santa Catalina Isl. (Erythea 7:144).

Refs.—TRIFOLIUM MACRAEI H. & A. Bot. Misc. 3:179 (1833), type loc. "Baths of Collina" (Chile), *Macrae;* McDer. N. Am. Sp. Trifolium 202, pl. 81 (1910); Jepson, Fl. W. Mid. Cal. 305 (1901), ed. 2, 227 (1911), Man. 545 (1925). *T. catalinae* Wats. Proc. Am. Acad. 25:128 (1890), type loc. Santa Catalina Isl., *T. Brandegee. T. macraei* f. *catalinae* McDer. l.c. 204, pl. 82. *T. bicephalum* Elmer, Bot. Gaz. 41:312 (1906), type loc. San Pedro, San Mateo Co., *Elmer* 4812. *T. mercedense* Kennedy, Muhl. 9:17 (1913), type loc. Lake Merced, San Francisco, *Tracy* 1822 (stems stout and erect; calyx-tube 1 line long, teeth 2½ lines long).

38. **T. amoenum** Greene. TWO-FORK CLOVER. Stem stout, erect, commonly one from the base, dichotomously branched only above, ⅓ to 2 feet high, few-headed; herbage more or less densely pubescent; leaves subsessile; leaflets broadly

obovate, ¾ to 1¼ inches long; peduncles straight, 1½ to 4½ inches long; heads globose-ovate, densely-flowered, 1 to 1⅓ inches long; calyx-tube about 1¼ lines long, the teeth conspicuously plumose, linear-subulate to filiform, 3 to 5 lines long; corolla purplish, tipped with white.

Valley fields, 20 to 200 feet: Marin and Sonoma Cos. to Solano Co. May-June.

Field note.—The stem, in a striking and usual form of the species, is simple below and once-forked above. Such plants with their very large heads, larger than those of any other native annual clover, are, in seasons of good rainfall, interesting objects to the botanist in the late vernal fields, all the more in that the individuals are commonly solitary, spaced a few rods or a quarter mile apart. In this respect it differs markedly from the gregarious T. dichotomum H. & A., though so closely related genetically to that species.

Locs.—Olema, Marin Co., *K. Brandegee;* Petaluma, *Tracy* 5548; Napa Jct., *Michener & Bioletti;* Vacaville, *Jepson* 13,649.

Refs.—TRIFOLIUM AMOENUM Greene, Fl. Fr. 27 (1891), type loc. Vanden, Solano Co., *Greene;* Jepson, Fl. W. Mid. Cal. 306 (1901), Man. 545 (1925). *T. dichotomum* McDer. N. Am. Sp. Trifolium 219 (1910) in part; Jepson, Fl. W. Mid. Cal. ed. 2, 227 (1911) in part; not T. dichotomum H. & A. (1840).

39. **T. dichotomum** H. & A. INDIAN CLOVER. Stems erect or ascending, 6 to 16 inches high; herbage sparsely to densely pubescent; petioles slender; leaflets ovate to elliptical or cuneate-obovate, 4 to 11 lines long; stipules small, ovate-acuminate; peduncles curved or retro-curved at apex, 2 to 6 inches long; heads cylindric to ovate-cylindric, most commonly a little spike-like, truncate at top, turbinate at base, 6 to 12 lines long; calyx-tube about 1 line long, the teeth subulate-filiform, plumose, 2½ to 3½ lines long; corolla cream-tipped, longer than the calyx; pods 1-seeded.

Low hills, 200 to 1000 feet: Coast Ranges from Santa Clara Co. to Contra Costa, Solano and Humboldt Cos. Apr.-May.

Distribution note.—Locally gregarious on the lowest foothills, Trifolium dichotomum is almost always found as colonies on heavy adobe soil. These colonies are commonly a few yards to a rod across and usually sharply defined. Indian Clover is rather uncommon on the whole but is seldom seen as solitary individuals. In the North Coast Ranges individuals with reduced heads are sometimes collected; such forms simulate T. albopurpureum T. & G., but the heads are narrowly oblong as compared with that species.

Locs.—Los Gatos, *Heller* 7423; betw. Mission San Jose and Livermore, *Heller* 7316; Crystal Springs Lake, San Mateo Co., *Davy* 1068; Caux's Cabin, w. of St. Helena, Hoods Peak Range, *Jepson* 13,664; Conn Valley, Napa Range, *Jepson* 6243, 13,647; Howell Mt., *Jepson* 13,665; summit Pope Valley grade e. of Calistoga, *Jepson* 13,663; Rowes sta., n. Mendocino Co., *Chandler* 1038; Ft. Seward, Humboldt Co., *Tracy* 4452.

Var. **turbinatum** Jepson. Three to 6 inches high; heads narrowly or broadly turbinate, sometimes broadly ovate, 4 to 8 lines high; corollas longer than the calyces.—Mountain slopes, 500 to 3000 feet: Santa Clara Co. to Marin Co.

Locs.—Mt. Hamilton, *Jepson* 4225, 4192; Rock Spr., Mt. Tamalpais, *Jepson* 7565; Ross Valley, Marin Co., *Jepson* 13,648.

Refs.—TRIFOLIUM DICHOTOMUM H. & A. Bot. Beech. 330 (1840), type from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. 306 (1901), Man. 545, fig. 535 (1925). *T. macraei* var. *dichotomum* Brew.; Wats. Proc. Am. Acad. 11:129 (1876). *T. californicum* Jepson; McDer. N. Am. Sp. Trifolium 215, pl. 87 (1910); Fl. W. Mid. Cal. ed. 2, 228 (1911). Var. TURBINATUM Jepson, Fl. W. Mid. Cal. 306 (1901), type loc. Ross Valley, Marin Co., *Jepson* 13,648; Man. 545 (1925). *T. californicum* f. *turbinatum* Jepson; McDer. l.c. 217, pl. 88; Fl. W. Mid. Cal. ed. 2, 228 (1911). *T. petrophilum* Hel. Muhl. 2:298 (1907), type loc. Mt. St. Helena, *C. F. Baker* 2625. *T. dichotomum* f. *petrophilum* McDer. l.c. 221; Jepson, Fl. W. Mid. Cal. ed. 2, 227 (1911)

40. **T. albopurpureum** T. & G. RANCHERIA CLOVER. (Fig. 201.) Stems slender, ascending or slightly decumbent, 8 to 16 inches high; herbage pubescent; leaflets obovate to cuneate-oblong, obtuse, 3 to 7 (or 12) lines long; heads hemispherical, or somewhat elongated, 4 to 7 lines long, the terminal ones on long peduncles, the lateral on short peduncles; corolla dark purple, barely or not at all longer than the plumose calyx-teeth; pods 1 or 2-seeded.

Valleys and hillsides, 20 to 4600 feet: coastal Southern California; Coast Ranges; Tehachapi Mts.; Sierra Nevada foothills from Tulare Co. to Amador Co. North to Washington. Apr.-May.

Geog. note.—Trifolium albopurpureum T. & G. may well be regarded as the most abundant in individuals and the most widely distributed species of any clover in California. Adapted indifferently to thin or gravelly soils or to rich soils, growing alike on arid hills, mesas, moist flats and dry valleys, seasons of average rainfall make it a common species. Its variation is marked but restrained within rather narrow morphologic limits.

Locs.—Coastal S. Cal.: Cuyamaca Lake, San Diego Co., *Peirson* 5974; Beaumont, *Gilman* 15; Redlands, *Parish;* Highland, San Bernardino Valley, *Parish;* San Antonio Cañon, *Peirson* 2154; Purisima Hills, Santa Barbara Co., *Jepson* 12,654. Coast Ranges: Priest Valley, se. Monterey Co., *Jepson* 2676; Santa Margarita, *Jepson* 11,966; Los Gatos, *Heller* 7416; Livermore, *Jepson* 13,670; Mt. Diablo, *Jepson* 9860; Oakland Hills, *Jepson* 6860; Fish ranch, Berkeley Hills, *Jepson* 13,671; Willits, *Jepson* 2484; Van Duzen River valley, *Tracy* 2854; Klamath Hills, Yreka, *Butler* 710. Tehachapi Mts.: Keene, near Bear Mt., *Jepson* 7156. Sierra Nevada foothills: Limekiln Creek, Tulare Co., *Jepson* 2800; Table Mt., Fresno Co., *Jepson* 15,110; Yankee Hill, Tuolumne Co., *A. L. Grant* 755; Willow Sprs. sta., Amador Co., *Jepson* 15,254. Northern Sacramento Valley: Rosewood, w. Tehama Co., *Jepson* 13,646; Redding, *Blankinship.*

Refs.—TRIFOLIUM ALBOPURPUREUM T. & G. Fl. 1:313 (1838), type from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. 306 (1901), ed. 2, 227 (1911), Man. 546 (1925); McDer. N. Am. Sp. Trifolium 207, pl. 83 (1910). *T. neolagopus* Loja. Nuov. Giorn. Bot. Ital. 15:194 (1883), type loc. "in montibus Californiae prope Sancta Inez", *E. Cooper.* *T. albopurpureum* var. *neolagopus* McDer. l.c. 209, pl. 84; Jepson, Fl. W. Mid. Cal. ed. 2, l.c., Man. l.c. *T. columbinum* var. *argillorum* Jepson, Fl. W. Mid. Cal. 307 (1901), type loc. Mt. St. Helena grade, Napa Co., *Jepson* 13,740. *T. albopurpureum* var. *neolagopus* f. *argillorum* Jepson; McDer. l.c. 211, pl. 84; Jepson, Fl. W. Mid. Cal. ed. 2, l.c. *T. macraei* var. *albopurpureum* Greene, Fl. Fr. 26 (1891). *T. helleri* Kennedy, Muhl. 9:25 (1913), type loc. Los Gatos, Santa Clara Co., *Kennedy.* *T. traskae* Kennedy, Muhl. 9:19 (1913), type loc. Santa Catalina Isl., *Kennedy* (leaflets elliptical, the upper narrower, attenuate at both ends, ex char.). *T. pseudoalbopurpureum* Kennedy, l.c. 20, type loc. Surf, Santa Barbara Co., *Kennedy* (upper leaves oblanceolate; calyx-teeth 1 line long, equaling the tube, ex char.). *T. insularum* Kennedy l.c. 29, type loc. Santa Catalina Isl., *Trask* (calyx-teeth exceeding the corolla by nearly 1 line, ex char.).

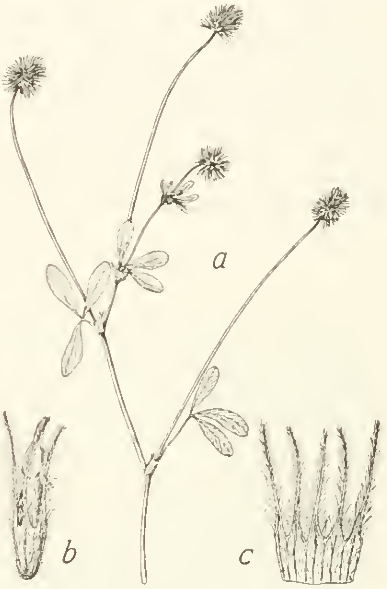

Fig. 201. TRIFOLIUM ALBOPURPUREUM T. & G. *a*, flowering branchlet, × ⅓; *b*, fl., × 3; *c*, calyx spread open, × 3.

41. **T. olivaceum** Greene. VALLEY CLOVER. Stems erect or ascending, 8 to 12 inches high; herbage pubescent (commonly somewhat appressed) and glaucous throughout; leaflets cuneate-obovate, serrulate, 4 to 12 (or 15) lines long; peduncles stout; heads broadly ovate to hemispherical, subtruncate to turbinate at base, bright olive-green, 6 to 10 lines high; corollas 2½ to 3 lines long, hidden by the long and pubescent calyx-teeth; calyx-tube 1 to 1½ lines long; calyx-teeth 4 to 5 lines long; corolla whitish and purplish; banner oblong, denticulate at apex; pods glabrous or essentially so, 1-seeded.

Low hills and valley fields, 50 to 1000 feet: Sacramento Valley; northern Sierra Nevada foothills; eastern Contra Costa Co. Apr.

Historical note.—In the two decades from 1870 to 1890, and doubtless earlier, this species was abundant in the hayfields of the Sacramento Valley, especially in central Solano Co., forming in certain years a major portion of the wild or volunteer hay crop. It is probable that it is a hybrid mutant, arising from forms of Trifolium albopurpureum, a mutant which under the favorable conditions of a rich soil and seasons of high rainfall developed luxuriantly in the form represented by topotype specimens. Since that early day Trifolium olivaceum has become rare in Solano Co. and is seldom found again in anything like its former luxuriance or robustness. The var. columbinum is to be regarded as an exactly parallel mutant, since it developed under the same conditions in the same locality. Morphologically viewed these two forms represent extreme variations in the T. albopurpureum group. It is possible to present a long series of specimens of T. albopurpureum with increasing size of heads ending in T. olivaceum and another similar series ending in var. columbinum. The banner of T. olivaceum is oblong, with the apex irregularly denticulate; the oblong brown seeds are faintly mottled. The banner of var. columbinum is ovate-oblong, dilated at base; the oval brown seeds are unmottled.

Locs.—Anderson, Shasta Co., *Alice King;* Penryn, Placer Co., *Curran;* Willows, Glenn Co., *Jepson* 13,657; Vacaville, *Jepson* 13,660; Sweeney Creek, nw. Solano Co., *Jepson* 8249.

Var. **columbinum** Jepson. DOVE CLOVER. Heads dove-color, longer than broad, 6 to 12 lines high; flowers similar to those of the species; pods pubescent, 1-seeded.—Sacramento Valley: Vacaville, *Jepson* 13,656; Sweeney Creek, nw. Solano Co., *Jepson* 8251; College City, Colusa Co., *Alice King.*

Var. **griseum** Jepson. Heads gray, broadly ovate, 6 to 8 lines high; corollas less completely concealed.—San Carlos Range.

Refs.—TRIFOLIUM OLIVACEUM Greene, Pitt. 1:4 (1887), type loc. Vacaville, Solano Co., *Greene;* McDer. N. Am. Sp. Trifolium 213, pl. 85 (1910); Jepson, Fl. W. Mid. Cal. ed. 2, 227 (1911), Man. 546, fig. 536 (1925). *T. columbinum* var. *olivaceum* Jepson, Fl. W. Mid. Cal. 307 (1901). Var. COLUMBINUM Jepson, Man. l.c. *T. columbinum* Greene, l.c., type loc. Vacaville, Solano Co., *Greene;* Jepson, Fl. W. Mid. Cal. 306 (1901). *T. olivaceum* f. *columbinum* McDer. l.c., pl. 86; Jepson, Fl. W. Mid. Cal. ed. 2, 228 (1911). Var. GRISEUM Jepson, Man. l.c., type loc. New Idria, San Benito Co., *Jepson* 2708.

17. **LOTUS** L. BIRD'S-FOOT TREFOIL

Herbs or suffrutescent plants. Leaves alternate, pinnately compound, with 3 to many leaflets; stipules foliaceous, scarious, or gland-like. Flowers solitary or umbellate, mostly leafy-bracteate. Calyx-teeth subequal. Corolla yellow to white, often marked with rose, red or purple. Stamens diadelphous. Pod flattened or terete, straight to strongly arcuate, one to many-seeded, dehiscent or indehiscent.—Species 110 to 155, all continents; best represented in the northern hemisphere. (Ancient Greek plant-name.)

Bibliog.—Bentham, Geo., Observations on the genus Hosackia and the American Loti (Trans. Linn. Soc. 17:363–368,—1835). Gray, A., Synopsis of the species of Hosackia (Proc. Acad. Phila. 15:346–352,—1863). Greene, E. L., Enumeration of N. Am. Loti (Pitt. 2:133–150,—1890). Ottley, A. M., A revision of the California species of Lotus (Univ. Cal. Publ. Bot. 10:189–305, pls. 61–82,—1923); [the genus Lotus in] Jepson, Man. 547–556,—1925.

A. Stipules foliaceous or scarious; flowers several to many in long-peduncled umbels; pods dehiscent, straight, not beaked or only abruptly and shortly so, remaining erect (Subgenus HOSACKIA).

Bract usually distant from the umbel; pedicels ½ to 5 lines long.
  Herbage densely white-velvety; corolla-banner reddish, wings white; n. Sierra Nevada.......... 1. *L. incanus.*
  Herbage not velvety.
    Herbage (in mature plant) glabrous or subglabrous.
      Corolla greenish-yellow; umbels mostly one-sided; leaflets thickish.......... 2. *L. crassifolius.*
      Corolla white, the banner red; umbels not one-sided; leaflets thinnish.......... 3. *L. aboriginus.*
    Herbage short-villous, often viscid-glandular; corolla-banner red, keel and wings white; leaflets thinnish..........4. *L. stipularis.*
Bract borne at base of umbel or none; pedicels about ½ line long.
  Herbage glabrous; stems arising from a thickened root-crown; claws of petals well exserted from calyx-tube.
    Bracts foliaceous; corolla-banner yellow, the wings rose or lilac; Coast Ranges.......... 5. *L. formosissimus.*
    Bracts usually reduced to a scarious involucre; corolla-banner and keel yellow, the wings white; n. Sierra Nevada..........6. *L. pinnatus.*
  Herbage appressed-pubescent; stems arising from a slender branched rootstock; claws of petals scarcely or obscurely exserted from calyx-tube..........7. *L. oblongifolius.*

B. Stipules reduced to dot-like often reddish glands.

1. PODS DEHISCENT, STRAIGHT OR NEARLY SO, 3½ LINES OR MOSTLY ½ TO 1¾ INCHES LONG, NOT BEAKED OR ONLY ABRUPTLY AND SHORTLY SO, 2 TO MANY-SEEDED, REMAINING ERECT (Subgenus ACMISPON).

a. Wings conspicuously longer than keel; banner attenuate into the claw; stigma subtended by a collar of spreading hairs; umbels peduncled.

Perennials.

Leaf-rachis 3 to 12 lines long, the 7 or 8 leaflets scattered along it; leaves 1 to 2¾ inches long; umbels commonly 4 to 8-flowered; bracts of 1 to 3 large leaflets; stems very leafy........8. *L. grandiflorus.*

Leaf-rachis ⅙ to ½ line long, the 3 to 5 leaflets palmately or short-pinnately crowded on it; leaves 3 to 8 (or 11) lines long; umbels 1 or 2 (or 3)-flowered; bracts none or of 1 small leaflet; deserts.

Stems not prostrate; leaflets obovate, oblong or oblanceolate.

Plants erect, rush-like; herbage canescent or greenish; flowers 7 to 8 lines long........9. *L. rigidus.*

Plants with decumbent or ascending stems; herbage greenish; flowers 5 lines long....10. *L. wrightii.*

Stems prostrate; herbage silvery-silky; leaflets commonly cuneate-obovate; San Bernardino Mts. to Santa Rosa Mts........11. *L. argyraeus.*

Annuals; umbels 1 to 3-flowered; seeds granulose.

Leaves not succulent; leaflets linear-oblong; seeds quadrate; mainly cismontane........12. *L. strigosus.*

Leaves a little succulent; leaflets obovate or roundish-spatulate; seeds subglobose; deserts....13. *L. tomentellus.*

b. Wings about equaling keel; banner abruptly clawed; stigma destitute of hairy collar; annuals.

Umbels 1 to 5-flowered; leaf-rachis dilated........14. *L. salsuginosus.*

Umbels reduced to one flower.

Flowers peduncled; leaf-rachis not dilated or scarcely.

Calyx-teeth shorter than tube; pods constricted between seeds; herbage glabrous........15. *L. micranthus.*

Calyx-teeth longer than tube; pods slightly or not at all constricted between the seeds; herbage villous to subglabrous........16. *L. americanus.*

Flowers subsessile in the axils; leaf-rachis dilated or ribbon-like.

Stems few, erect, stoutish; corolla cream-color; n. Cal........17. *L. denticulatus.*

Stems several to many, slender, prostrate, decumbent or diffuse; corolla yellow; widely distributed.

Pubescence densely villous; calyx-teeth usually 2 times as long as tube; pods 3½ to 5 lines long........18. *L. humistratus.*

Pubescence mostly scanty, the hairs ascending or somewhat appressed, or the plants glabrate; calyx-teeth shorter than or equaling the tube; pods 5 to 10 lines long........19. *L. subpinnatus.*

2. PODS INDEHISCENT, 2 TO 7 LINES LONG, MOSTLY ATTENUATE INTO A LONG OFTEN INCURVED BEAK, REFLEXED, 1 TO SEVERAL-SEEDED; LEAVES SHORTLY PINNATE, 2½ TO 7 (OR 14) LINES LONG (Subgenus SYRMATIUM).

a. Annuals; pods usually 2-seeded, more or less constricted between the seeds, strongly curved.

Umbels peduncled; flowers 1½ to 3 lines long; style glabrous; San Diego coast........20. *L. nuttallianus.*

Umbels subsessile; flowers 1½ to 2¼ lines long; style pubescent; cismontane S. Cal........21. *L. hamatus.*

b. Perennials; pods 1 to several-seeded, commonly not constricted between the seeds.

Herbage woolly, silky or spreading-villous; stems several to many from the root-crown, trailing or prostrate.

Pubescence appressed; pods attenuately beaked.

Leaves all with 3 leaflets; herbage canescent; umbels sessile or subsessile, mostly 1 to 3-flowered; bracts none; calyx lightly pubescent; mainly in South Coast Ranges and S. Cal........22. *L. leucophyllus.*

Leaves some with 5 leaflets and some with 4 or 3; umbels 3 to 8-flowered; bracts usually present, sometimes none.

Herbage silvery-tomentose; leaflets 3, 4 or 5; umbels sessile or subsessile; calyx densely silky; S. Cal., South Coast Ranges and s. Sierra Nevada foothills mainly........23. *L. argophyllus.*

Herbage minutely pubescent; leaflets 4 or 5; umbels sessile or peduncled; calyx pubescent; Sierra Nevada mainly........24. *L. douglasii.*

Pubescence woolly or villous, the hairs more or less spreading; pods scarcely beaked or only abruptly and shortly so.

Umbels 4 to 7-flowered, making a loose cluster; peduncles 2 to 4 lines long; mainland...... 25. *L. eriophorus.*

Umbels 12 to 20-flowered, making a dense globose cluster; peduncles ¼ to 1¾ inches long; insular.......... 26. *L. ornithopus.*

Herbage glabrous or subglabrous or the pubescence scanty and appressed; stems commonly wiry or rush-like in habit, the leaves small and often few.

Branches stoutish or wiry, but not filiform; leaves 3 to 12 lines long.

Abundant species, widely distributed; calyx-teeth subulate; umbels sessile or short-peduncled, some or many 3 to 5-flowered, and some or few 1 or 2-flowered, the vars. 5 to 12-flowered; bracts none, rarely present.......... 27. *L. scoparius.*

Rare species along the central coast.

Umbels 5 to 11-flowered, peduncled; bracts of 1 or 2 leaflets; calyx-teeth subulate.... 28. *L. benthamii.*

Umbels 1 to 4-flowered, mostly subsessile; bracts mostly none; calyx-teeth short-triangular.......... 29. *L. junceus.*

Branches almost filiform; leaves ½ to 3 lines long; umbels 1 or 2-flowered; rare, e. San Diego Co.......... 30. *L. haydonii.*

1. **L. incanus** Greene. SEYMOUR LOTUS. Stems several from the root-crown, erect, 4 to 11 inches high; herbage clothed in a dense thick fur of soft hairs; leaves ¾ to 2½ inches long; leaflets 7 to 13, obovate to oblong or lanceolate, 3 to 8½ lines long, those of the lower leaves orbicular, crowded; peduncles ¼ to 1¼ inches long; umbels 5 to 12-flowered; bract commonly of 5 leaflets; flowers 6 to 7 lines long; calyx-teeth linear-subulate, ½ to ⅖ as long as tube; banner reddish, wings white; pods linear to narrowly oblong, thick or subterete, ¾ to 1 inch long, 1½ to 2¾ lines wide.

Opens in pine woods, 2500 to 3600 feet: northern Sierra Nevada from Placer Co. to Butte Co. May-July.

Locs.—Alta, *K. Brandegee;* Cape Horn, *K. Brandegee;* Blue Cañon, *H. A. Walker* 1278; Grizzly Ridge, Middle Fork Yuba River, Nevada Co., *L. S. Smith* 1554; Stirling City, *Heller* 10,797.

Refs.—LOTUS INCANUS Greene, Pitt. 2:147 (1890); Jepson, Man. 548, fig. 539 (1925). *Hosackia incana* Torr. Pac. R. Rep. 4:79, pl. 4 (1857), type loc. dry hills near South Yuba, *Bigelow*. There is a prior *Lotus incanus* Dougl. in Hook. Fl. Bor. Am. 1:134 (1830), but published as a synonym. The common name, above, is for Leland Seymour Smith, United States Forest Service, long a collector of Sierran plants who adds a new station to the few that are known for this species.

2. **L. crassifolius** Greene. BUCK LOTUS. Stems erect, fistulous, 1½ to 4 feet high, with long internodes, the branches few, often flexuous; herbage glabrous or minutely puberulent; leaves 3½ to 7¾ inches long; leaflets commonly 9 or 11, oval, rhombic or obovate, almost coriaceous, 10 to 16 lines long, on petiolules 1 line long; peduncles 1 to 3 inches long, bracted above the middle with a 3-foliolate petioled leaf; umbels 7 to 15-flowered, some or all one-sided; flowers 6 to 7 lines long; calyx-teeth usually very short and subulate-triangular; corolla greenish-yellow or whitish, marked with purple spots; pods terete, 1½ to 2¾ inches long, (1½ or) 2 to 3 lines wide, 7 to 12-seeded.

Dry montane slopes or flats, back of the coast or in the interior, 2300 to 8000 feet: high mountains of Southern California; Coast Ranges from San Luis Obispo Co. to Siskiyou Co.; Sierra Nevada from Kern Co. to Modoc and Siskiyou Cos. South to Lower California. North to Washington. May-July.

Field note.—A common species in the Yellow Pine and upper chaparral belt, Lotus crassifolius is seldom found near the coast. The heads of flowers in anthesis are always turned downward. In the fruiting stage, the branches often bend to the ground under the weight of the pods.

Locs.—S. Cal.: Cuyamaca, *T. Brandegee;* Palomar, *Jepson* 1490; Fern Valley, San Jacinto Mts., *Munz* 6061; San Bernardino Mts., *Parish;* Mt. Gleason, *Elmer* 3697; Rock Creek, San Gabriel Mts., *Peirson* 103. Coast Ranges: San Antonio trail, Santa Lucia Mts., *Jepson;* Alma Soda Spr., Santa Clara Co., *Heller* 7489; Mt. Diablo, *Bioletti;* Collins Camp, Vaca Mts., *Jepson* 13,782; Wild Horse Cañon, nw. Solano Co., *Jepson* 2452b; Potter Valley, Mendocino Co., *Purpus;* Snow Mt., n. Lake Co., *M. S. Baker;* betw. Orleans Bar and Sommes Bar, ne. Humboldt Co., *Chandler* 1470; Sisson, Siskiyou Co., *Jepson* 13,783; Humbug Creek, n. Siskiyou Co., *Butler* 775. Tehachapi Mts., *Hasse & Davidson.* Sierra Nevada: Cedar Creek, North Fork Kaweah River, *Jepson* 13,796; Old Colony Mill, Marble Fork Kaweah River, *Jepson* 627; Lower Hot Sprs., South Fork San Joaquin River, *Jepson* 13,186; Yosemite, *Alice King;* Hetch-Hetchy, *Jepson* 3421; Donner Lake, *Heller* 7150; Mill Creek, Plumas Co., *R. M. Austin;* Susanville, *T. Brandegee;* Forestdale, Modoc Co., *M. S. Baker.*

Refs.—Lotus crassifolius Greene, Pitt. 2:147 (1890); Jepson, Fl. W. Mid. Cal. 300 (1901), ed. 2, 229 (1911), Man. 548, fig. 538 (1925). *Hosackia crassifolia* Benth. Trans. Linn. Soc. 17:365 (1837), type from Cal., *Douglas. H. stolonifera* Lindl. Bot. Reg. t. 1977 (1837), type from Cal., *Douglas. H. stolonifera* var. *pubescens* Torr. Pac. R. Rep. 4:79 (1857), type loc. Corte Madera, Marin Co., *Bigelow. H. platycarpa* Nutt.; T. & G. Fl. 1:323 (1838), type loc. "probably Blue Mts. of the Oregon", *Douglas, Nuttall.*

3. **L. aboriginus** Jepson nom. n. Indian Lotus. Stems prostrate to erect, arising at intervals from running rootstocks, ½ to 1¾ feet high; herbage nearly glabrous, the underside of the leaves glaucous; leaves 1 to 5½ inches long; petioles very short or almost none; leaflets 9 to 13, oblong-obovate, 5 to 15 lines long; peduncles 1 to 2 inches long; umbels 5 to 11-flowered; bracts 3-foliolate; flowers 4 to 4½ lines long; calyx-tube turbinate-campanulate, its teeth triangular, ciliolate; corolla pink; pods ¾ to 1½ inches long.

Plains, hills or mountains, on the borders of woods, 20 to 1500 feet: along or near the coast line from Sonoma Co. to Del Norte Co. North to Washington. Rather infrequent. Apr.-July.

Field note.—This Lotus has an area of distribution which is on the whole quite distinct from that of L. stipularis Greene to which, as a variety, it has been referred. It differs, it is said, so much in habit from that species that good field observers in the North Coast Ranges, such as Jos. P. Tracy and M. S. Baker, believe that it should be separated from L. stipularis, either specifically, or referred to some other species. Our first collection (no. 1944) was made on Redwood Creek in northern Humboldt Co. in 1902; since that time the specimens have lain in the herbarium under the manuscript name L. aboriginus Jepson. The species name refers to the Indian rancheria on which the plants were collected. The species itself had a few years previously been recognized as a distinct unit by Alice Eastwood, but her name is preoccupied in Lotus.

Locs.—Gualala, Sonoma Co., *Michener & Bioletti;* Navarro, *Edith Byxbee;* Ft. Bragg, *Ottley* 1501; Redwood Creek at Berry's Ranch, n. Humboldt Co., *Jepson* 1944. Oregon: Mt. Emily, sw. Curry Co., *Jepson* 9375.

Refs.—Lotus aboriginus Jepson. *Hosackia rosea* Eastw. Proc. Cal. Acad. ser. 2, 6:424, pl. 55 (1896), type loc. along road to Glen Blair near Fort Bragg, *Eastwood;* not Lotus roseus Forskal (1775). *L. stipularis* var. *subglaber* Ottley, Univ. Cal. Publ. Bot. 10:200 (1923); Jepson, Man. 549 (1925).

4. **L. stipularis** Greene. Balsam Lotus. Stems erect, 1 to 2 feet high, from a woody root-crown; herbage loosely villous, often viscid-glandular; leaves 1 to 2¼ inches long; leaflets 11 to 13, oval to nearly oblong, 3 to 6½ lines long, the first pair often at the base of the rachis and covering the stipules; stipules large (2½ to 8 lines long), ovate-acuminate; peduncles 1¼ to 2½ inches long; umbels 4 to 12-flowered; bract petioled, of 3 to 5 leaflets, set a little below the umbel; flowers 5 to 5½ lines long; calyx long-campanulate, its teeth short-triangular or triangular-acute, ⅓ to ½ as long as the tube; corolla-banner red, the keel and spreading wings white; pods 8 to 15 lines long, 1½ to 2 lines wide, contracted at base to a short stipe, often glandular.

Dry hillsides and mountain slopes, 10 to 3800 feet: Coast Ranges from Monterey Co. to Humboldt Co.; Sierra Nevada from Tulare Co. to Mariposa Co. Infrequent. Apr.-July.

Locs.—Coast Ranges: Monterey to El Sur, *Coulter* 441; Loma Prieta Peak, Santa Cruz Mts., *Elmer* 4449; Kings Mts., Santa Clara Co., *C. F. Baker;* Oakland Hills, *Bolander;* Hoods Peak, Sonoma Co., *Bioletti;* Cobb Mt., Lake Co., *Leighthold;* Ukiah, *Blasdale* 1005; Fort Bragg, *Ottley* 1512; Eureka, *Tracy* 1078. Sierra Nevada: Watson Spr., North Fork Kaweah River, *Jepson* 588; Cedar Creek, Tulare Co., *Jepson* 596; Agua Fria, Mariposa Co., *Congdon.*

Refs.—Lotus stipularis Greene, Pitt. 2:147 (1890); Jepson, Fl. W. Mid. Cal. 300 (1901), ed. 2, 229 (1911), Man. 548 (1925). *Hosackia stipularis* Benth. Trans. Linn. Soc. 17:365 (1837), type from Cal., *Douglas. H. macrophylla* Kell. Proc. Cal. Acad. 2:123 (1863), *Andrews* 116, type loc. not stated. *H. balsamifera* Kell. l.c. 125, type loc. not stated (viscid-glandular and fragrant). *L. balsamiferus* Greene, Man. Reg. S. F. Bay 93 (1894).

5. **L. formosissimus** Greene. WITCH'S TEETH. Stems decumbent, ½ to 2 feet long; herbage glabrous, light green; leaves 1 to 2¼ inches long; basal leaves with 3 to 5 obovate retuse leaflets 2½ to 4 lines long, upper leaves with 5 or 7 (or 9) oblanceolate to elliptical acute leaflets 5 to 7½ lines long; peduncles ¾ to 2½ inches long; umbels 4 to 6-flowered, subtended by a petioled bract of 1 to 3 (or 7) leaflets; flowers 6½ to 10 lines long; calyx slightly 2-lipped, its teeth lanceolate, acuminate, ⅓ to ½ as long as the tube; banner yellow, oblong, reflexed; keel and spreading wings crimson-lilac; claws of the keel longer than the bluntly beaked blades; pods straight, 1 to 1¼ inches long, ½ to 1¼ lines wide.

Moist ground or springy places, 10 to 1500 feet: mostly near the coast from Monterey Co. to Del Norte Co. North to Washington. Mar.-June.

Locs.—Carmel, *Ottley* 1310; Pacific Grove, *Tidestrom;* Lake San Andreas, San Mateo Co., *Davy* 1030; Bolinas Bay, *Chesnut & Drew;* Mt. Tamalpais, *Newlon* 96; Olema, Marin Co., *Jepson* 8286; Bodega, Sonoma Co., *Chandler* 674; Del Mar, nw. Sonoma Co., *R. P. Brandt;* Lost Valley, Mayacamas Range, *Jepson* 3028; Sherwood Valley, Mendocino Co., *Davy* 5190; betw. Eureka and Arcata, *Jepson* 1922; Requa, Del Norte Co., *Davy* 5903.

Refs.—LOTUS FORMOSISSIMUS Greene, Pitt. 2:147 (1890); Jepson, Fl. W. Mid. Cal. 301 (1901), ed. 2, 229 (1911), Man. 549, fig. 540 (1925). *Hosackia gracilis* Benth. Trans. Linn. Soc. 17:365 (1837), type from Cal., *Douglas;* not Lotus gracilis Salisb. (1796). *Anisolotus formosissimus* Armstrong & Thornber, Field Book Western Wild Fls. 242 (1915).

6. **L. pinnatus** Hook. MEADOW LOTUS. Stems several, erect, arising from creeping rootstocks, 1 to 1¾ feet high; herbage glabrous; leaves large (1 to 3 inches long), remote; leaflets 5 to 9, oval or obovate, obtuse or acute, somewhat mucronulate, 4 to 15 lines long; peduncles 1 to 5¾ inches long; umbels 3 to 7-flowered, not usually leafy-bracteate, but with an involucre of short scarious bractlets; flowers 6 to 7½ lines long, more or less reflexed in anthesis; calyx 2-lipped; banner and keel yellow, the wings white; pods 1½ to 2½ inches long, ¾ to 1½ lines wide.

Moist flats, 3000 to 6000 feet: Trinity Co.; Sierra Nevada from Calaveras Co. to Shasta Co. North to Washington. Apr.-July.

Locs.—Coast Ranges: Weaverville (ne. of), *H. S. Yates* 344; Redding (Univ. Cal. Publ. Bot. 10:203). Sierra Nevada: Pooles Mdw., Calaveras Co., *Davy* 1435; Emigrant Gap, Placer Co., *Jones* 3282; Donner Lake, *Sonne;* Quincy, *Jepson* 4141; Montgomery Creek, ne. Shasta Co. (Univ. Cal. Publ. Bot. 10:203); Stillwater Creek, Shasta Co., *Blankinship.*

Refs.—LOTUS PINNATUS Hook. Bot. Mag. t. 2913 (1829), type loc. "between Fort Vancouver and the grand Rapids upon the Columbia", *Douglas;* Jepson, Man. 549 (1925). *Hosackia bicolor* Dougl.; Benth. in Lindl. Bot. Reg. t. 1257 (1829), based on Lotus pinnatus Hook. *L. bicolor* Frye & Rigg, Elem. Fl. of the Northwest 140 (1914).

7. **L. oblongifolius** Greene. STREAM LOTUS. Stems erect, 6 to 12 inches high, bright green, arising from running rootstocks; herbage hirsutulose, often thinly so; leaves 1¼ to 2¾ inches long; leaflets 7 to 11, linear-lanceolate to elliptical, acute at both ends, 5 to 15 lines long; peduncles 1 to 4¾ inches long; umbels 1 to 5-flowered; flowers 4 to 7½ lines long; calyx-tube turbinate-campanulate, somewhat hirsutulose; banner yellow or red-orange, ovate, erect; wings and keel white, claws of the keel shorter than the broad rounded limb; pods straight, 1¼ to 2 inches long, ⅔ to 1 line wide.

Along streams in the foothills and mountains, 1000 to 6500 feet: cismontane Southern California; north to the Tehachapi Mts. Frequent. May-Oct.

Locs.—San Diego, *Palmer* 61; Mesa Grande, e. San Diego Co., *E. Ferguson* 96; Palomar Mt., *T. Brandegee;* Snow Creek, Mt. San Jacinto, *Clary* 18a; Strawberry Valley, Mt. San Jacinto, *Jepson* 2258a; San Bernardino, *Parish;* Little Bear Valley, San Bernardino Mts., *C. M. Wilder* 347; Lytle Creek Cañon, San Antonio Mts., *Abrams* 2628; Arroyo Seco, Pasadena, *Peirson* 100; Santa Monica, *Barber* 193; Rock Creek, San Gabriel Mts., *Peirson* 501; Victorville, *Jepson* 5606; Mt. Pinos, n. Ventura Co., *Hall* 6645; Bisses sta., Tehachapi Mts., *Dudley* 407; Kernville, *T. Brandegee.*

Var. **torreyi** Ottley. SIERRA LOTUS. Herbage subappressed-pubescent, becoming glabrate; leaves 1¼ to 2¾ inches long; leaflets oblanceolate or obovate, mostly obtuse, those of the uppermost leaves often elliptical or oblong and acute at both ends; flowers 5 to 7½ lines long.—Meadows, stream borders and in dry pine woods, 2200 to 7000 feet: Sierra Nevada; North Coast Ranges; frequent. May-Sept.

Locs.—Sierra Nevada: Lloyd Mdws., upper Kern River, *Jepson* 4907; Round Mdw., Giant Forest, *Jepson* 676; Bishop Creek, Inyo Co., *Shockley* 415; Markwood Mdw., Fresno Co., *Jepson* 16,026; Huntington Lake, *Jepson* 13,036; Crockers sta., Mariposa Co., *Blasdale;* Strawberry, Tuolumne Co., *Jepson* 6493; Murphy, Calaveras Co., *A. L. Grant* 100t; Pine Grove, Amador Co., *Hansen* 348; Woodford sta., Alpine Co., *Ottley* 1140; Fallen Leaf Lake, Eldorado Co., *M. S. Baker;* Bear Valley, Nevada Co., *Jepson* 13,790; Dogwood Creek, Middle Fork Feather River, sw. Plumas Co., *Jepson* 10,625; Eagle Lake, cent. Lassen Co., *Baker & Nutting.* Coast Ranges: Gasquet, Del Norte Co., *M. S. Baker* 3156; Sisson, Siskiyou Co., *Jepson* 13,791; Etna Creek, Siskiyou Co., *Butler* 397; Coffee Creek, Salmon Mts., *Hall* 8526; Mud Sprs., Trinity Summit, *Manning* 63; Horse Mt., Humboldt Co., *Tracy* 7629; Ft. Bragg, *Ottley* 1541; Big Horse Mt., n. Lake Co., *Jepson;* Howell Mt., *Jepson* 13,789.

Var. **cupreus** Ottley. Stems low, much-branched and flaccid; herbage glabrous; leaflets oblanceolate, mucronate, those of the lower leaves mostly cuneate-obovate; umbels 1 to 3-flowered; flowers 3½ to 4 lines long.—Meadows and rocky hills, 8000 to 9000 feet: southern Sierra Nevada. Localized form. June-Aug.

Locs.—Mt. Silliman, *Jepson* 738; Sand Mdw., South Fork Kaweah River, *Jepson* 4672.

Refs.—LOTUS OBLONGIFOLIUS Greene, Pitt. 2:146 (1890); Jepson, Man. 549 (1925). *Hosackia oblongifolia* Benth. Pl. Hartw. 305 (1848), type collected by Coulter, undoubtedly in cismontane S. Cal., erroneously stated as "vicinity of Monterey". *H. lathyroides* D. & H. Pac. R. Rep. 5^3:6, pl. 3 (1855), type loc. Fort Miller on the San Joaquin River, Fresno Co., *Heermann* (leaflets narrow). *H. oblongifolia* var. *angustifolia* Wats.; B. & W. Bot. Cal. 1:135 (1876), based on last. *L. lathyroides* Greene, Pitt. 2:146 (1890). *H. torreyi* var. *seorsus* Mcbr. Contrib. Gray Herb. 65:40 (1922), type loc. Idlewild, San Jacinto Mts., *M. F. Spencer* 1280 (plants less robust; pubescence hirsutulose; leaflets and flowers smaller; peduncles fewer-flowered; as compared with typical spms. of var. torreyi). Var. TORREYI Ottley, Univ. Cal. Publ. Bot. 10:205 (1923); Jepson, l.c. *Hosackia torreyi* Gray, Proc. Am. Acad. 8:625 (1873), type loc. betw. Clarks and Yosemite Valley, *Bridges, Torrey.* *L. torreyi* Greene, Pitt. 2:146 (1890); Jepson, Fl. W. Mid. Cal. 300 (1901), ed. 2, 229 (1911). *H. torreyi* var. *nevadensis* Gray l.c., type loc. near Donner Lake, *Torrey* (flowers smaller). Var. CUPREUS Ottley, Univ. Cal. Publ. Bot. 10:206 (1923). *L. cupreus* Greene, Lflts. 1:74 (1904), type loc. Hockett Mdws., Tulare Co., *C. F. Baker* 4373.

8. **L. grandiflorus** Greene. CHAPARRAL LOTUS. Stems several from the root-crown, erect, 1¼ to 2¼ feet high; herbage puberulent or even velvety; leaves 1 to 1½ (or 2¾) inches long; leaflets (5 or) 7 or 8, obovate, obtuse, mucronate, 3 to 10 (or 18) lines long; peduncles 2 to 3⅛ inches long; umbels 2 to 8-flowered; bract of 1 to 3 large leaflets; flowers 7 to 10 lines long; calyx hirsutulose, its teeth subulate to nearly linear, half to nearly as long as the tube; corolla creamy-white or lemon-yellow, turning deep rose with age; pods 1 to 1⅝ inches long, 1 to 2 lines wide, glabrous, brown, with a whitish callous line on the ventral suture.

Dry mountain opens or chaparral slopes, 500 to 6000 feet: Sierra Nevada from Shasta Co. to Nevada Co.; Tehachapi Mts.; Coast Ranges from Mendocino and Lake Cos. to San Luis Obispo Co.; western margins of the Mohave Desert; coastal Southern California. Mar.-June.

Note on variation.—In the typical form of Lotus grandiflorus the pubescence is usually short and appressed, but in drier situations at lower altitudes, and especially towards the interior, the herbage is often velvety-pubescent with spreading hairs (var. mutabilis Ottley); sometimes short peduncles are associated with this velvety-pubescent form (Strawberry Valley, Mt. San Jacinto, *Jepson* 2293), but again the peduncles are often long (Cajon Pass, *Peirson* 102, *Jepson* 6115) or somewhat short at the same locality (Cajon Pass, *Hall* 6224). On the ridge of the Vaca Mountains, above Collins Camp, the plants in 1892 were dwarfed, velvety-pubescent and shortly peduncled (*Jepson* 13,806). The next year, in 1893, vigorous plants with longer peduncles were collected at the same spot (*Jepson* 13,808). Taking California at large, the intermediates between the species and the var. mutabilis Ottley are about as numerous as the variety. Var. mutabilis is typically dwarfed with short peduncles and spreading pubescence; *Bolander* 4752 (Mendocino City "plains") has these characters save that the pubescence is appressed. The two forms of pubescence are not constantly associated with other characters, nor is there geographic segregation in connection with one definite character.

Locs.—Sierra Nevada: Donkey Mine, Shasta Co., *M. S. Baker;* Brush Creek, Butte Co., *Kate Conger;* Kres, w. Nevada Co., *Hall & Essig* 10,169. Tehachapi Mts., *Hasse & Davidson.* Coast Ranges: Fort Bragg, *W. C. Mathews* 19, 42a; Houghs Sprs., ne. Lake Co., *Jepson* 9008; Yolo

Mts., w. Yolo Co., *C. F. Baker* 2993; Vaca Mts., *Jepson* 13,808; Monte Rio, Sonoma Co., *Charlotte Hoak;* Mt. Tamalpais, *T. Brandegee;* Carmel Valley, *Brewer* 675; Arroyo Seco, Monterey Co., *Brewer* 677; Paso Robles, *Barber.* Coastal S. Cal.: Sycamore Cañon, Santa Inez Mts., *Jepson* 9141; Santa Monica Cañon, *Barber* 107; Lukens Peak, San Gabriel Mts., *Ottley* 683; near Cajon Pass on the desert side, *Mary Beal;* Glen Martin, San Bernardino Mts., *R. J. Smith* 12; Strawberry Valley, Mt. San Jacinto, *Jepson* 1286; Witch Creek, San Diego Co., *Alderson;* Descanso, San Diego Co., *T. Brandegee;* Cuyamaca, *T. Brandegee.*

Refs.—LOTUS GRANDIFLORUS Greene, Pitt. 2:145 (1890); Jepson, Fl. W. Mid. Cal. 301 (1901), ed. 2, 230 (1911), Man. 550, fig. 541 (1925). *Hosackia grandiflora* Benth. Trans. Linn. Soc. 17:366 (1837), type from Cal., *Douglas. Anisolotus grandiflorus* Hel. Muhl. 8:20 (1912). *Hosackia macrantha* Greene, Bull. Cal. Acad. 1:81 (1885), type loc. Sweetwater Creek, Eldorado Co., *Curran* (more robust than the prevailing form). *L. macranthus* Greene, Pitt. 2:146 (1890). *Anisolotus macranthus* Hel. l.c. 48. *L. grandiflorus* var. *mutabilis* Ottley, Univ. Cal. Publ. Bot. 10:208 (1923); Jepson, Man. l.c. *Hosackia grandiflora* var.? *anthylloides* Gray, Proc. Acad. Phila. 15:350 (1863), type loc. Santa Lucia Mts., *Brewer. H. anthylloides* Millsp. Field Mus. Publ. Bot. 5:150 (1923). *L. leucophaeus* Greene, Pitt. 2:145 (1890); Jepson, Fl. W. Mid. Cal. 301 (1901), ed. 2, 230 (1911). *Anisolotus leucophaeus* Hel. Muhl. 8:48 (1912). *L. confinis* Greene, Erythea 1:258 (1893), type loc. "mountains of San Diego Co., near the U. S. and Mexican boundary", *R. D. Alderson,* definitely at Witch Creek acc. to herb. label.

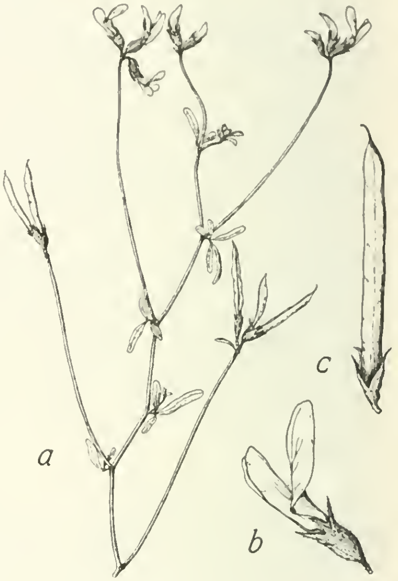

Fig. 202. LOTUS RIGIDUS Greene. *a,* fl. branch, × ⅓; *b,* fl., × 1; *c,* pod, × ⅔.

9. **L. rigidus** Greene. BROOM LOTUS. (Fig. 202.) Low but erect bush, 1¼ to 3 feet high; stems many from the root-crown, woody at base, coarse, rigid, rush-like; internodes long; herbage canescent to scantily puberulent, becoming glabrate; leaves few, short (2 to 8 lines long), shortly petioled or sometimes subsessile; leaflets 3 or 5, often palmately crowded, broadly oblong to obovate, obtuse or truncate, 1½ to 7 lines long, markedly variable in length; peduncles 1¼ to 3¾ inches long; umbels 1 to 3-flowered; bracts when present commonly of 1 small leaflet; flowers 7 to 8 lines long; calyx-teeth broadly subulate, ¼ to ½ as long as the tube (rarely almost equaling it); corolla yellow, aging brown-purple; pods linear, glabrous, straw-color, shining as if lacquered, terete, straight, ¾ to 1⅞ inches long, 1⅓ to 1⅔ lines wide; seeds globose, granulose.

Arid slopes or sandy washes, 1100 to 3000 feet: Inyo Co., south through the eastern Mohave Desert to the Colorado Desert. East to Utah and Arizona, south to Lower California. Mar.-June.

Field note.—The corolla is a clear lemon-yellow; it ages to brown-purple, the banner changing much later than the keel and wings, which change together.

Locs.—Pleasant Cañon, Panamint Range, *Hall* 6944; Argus Mts., Inyo Co., *Purpus* 5737; Hackberry Mt., near Goffs, e. Mohave Desert, *Ferris* 7250; Cottonwood Spr., Cottonwood Mts., *Jepson* 12,573; Lookout Mt. (n. of Indio), *Jepson* 5984; Palm Cañon, San Jacinto Mts., *Jepson* 1382; Devils Cañon, Santa Rosa Mts., *Clary* 4a; San Felipe Valley, e. San Diego Co., *Jepson* 8723; Vallecito, e. San Diego Co., *Jepson* 8586.

Refs.—LOTUS RIGIDUS Greene, Pitt. 2:142 (1890); Jepson, Man. 550 (1925). *Hosackia rigida* Benth. Pl. Hartw. 305 (1848), type loc. near "Monterey, *Coulter*", but obviously erroneous, undoubtedly collected in the Colorado Desert. *Anisolotus rigidus* Rydb. Bull. Torr. Club 33:144 (1906). *L. argensis* Cov. Contrib. U. S. Nat. Herb. 4:83 (1893), type loc. Shepherd's Cañon, Argus Mts., Inyo Co., *Coville & Funston* 736. *Anisolotus argensis* Hel. Muhl. 9:67 (1913).

10. **L. wrightii** Greene var. **multicaulis** Ottley. SCRUB LOTUS. Stems slender, branching from base, decumbent or ascending, 3 to 15 inches long; herbage

greenish, appressed-pubescent; leaves 2½ to 6 lines long; leaflets mostly 3 or 4, obovate, oblong or oblanceolate, 3 to 8 lines long; peduncles ½ to 1¾ inches long; umbels commonly 2-flowered; flowers 5 lines long; calyx ½ as long, teeth narrowly lanceolate to linear, ½ as long as the tube; corolla lemon-yellow, fading reddish-brown; pods linear, flattish, a little curved, especially at apex, 10 to 15 lines long, 1 to 1½ lines wide; seeds subglobose.

Desert mesas, 3500 to 4500 feet: eastern Mohave Desert. East to Nevada. Apr.-May.

Locs.—Providence Mts., *T. Brandegee;* Barnwell, New York Mts., *Jepson* 5461.

Refs.—LOTUS WRIGHTII Greene, Pitt. 2:143 (1890). *Hosackia wrightii* Gray, Pl. Wright. 2:42 (1853), type loc. "copper mines", N. Mex., *Wright* 1000. Var. MULTICAULIS Ottley, Univ. Cal. Publ. Bot. 10:211 (1923), type loc. Barnwell, *K. Brandegee;* Jepson, Man. 551 (1925).

11. **L. argyraeus** Greene. Cañon Lotus. Stems prostrate, 3 to 8 inches long, the internodes short; herbage white-silky, also the calyces and pods; leaves 2½ to 4 lines long, often broader than long, the petiole and rachis short; leaflets 3 to 5, cuneate-oblanceolate or -obovate, mostly obtuse to truncate, 1½ to 4½ lines long; peduncles ½ to 1½ inches long; umbels 1 or 2 (or 3)-flowered; flowers 3¾ to 5 lines long; calyx appressed-hirsute, a little brownish, its teeth subulate, ⅖ to ⅘ as long as the tube; corolla red in bud, yellow in anthesis, aging reddish; pods linear, straight, thickish, subglabrous or scantily strigulose, 5 to 11 lines long, 1 to 1½ lines wide; seeds oblong-spherical, smooth.

Cañons and mountain valleys, 2000 to 8000 feet: San Bernardino Mts. to the Santa Rosa Mts. South to Lower California. June-Sept.

Locs.—Deep Creek, San Bernardino Mts., *Munz* 2875; Cienega Seca Creek, San Bernardino Mts., *Munz* 6307; Holcomb Valley, San Bernardino Mts., *Parish* 3741; Bear Valley, San Bernardino Mts., *Parish* 1265; Coyote Cañon, sw. Riverside Co., *Jepson* 1440.

Refs.—LOTUS ARGYRAEUS Greene, Pitt. 2:144 (1890); Jepson, Man. 551 (1925). *Hosackia argyraea* Greene, Bull. Cal. Acad. 1:184 (1885), type loc. Cantillas Mts., L. Cal., *Orcutt. Anisolotus argyraeus* Hel. Muhl. 8:47 (1912).

12. **L. strigosus** Greene. Bishop's Lotus. Stems slender, decumbent or ascending, 2 to 10 (or 14) inches long; herbage thinly appressed-hirsutulous; leaves 4 to 14 lines long, sessile or subsessile; rachis flattened; leaflets 3 to 7, markedly unequal, linear-oblong, acute, the basal one about half as long as the terminal one; peduncles ⅙ to 1¼ inches long; umbels 1 or 2-flowered, subtended by a 1 to 3-foliolate sessile or subsessile bract; flowers 2½ to 5 lines long; calyx-teeth lanceolate, ½ to as long as tube; corolla yellow, fading reddish; pods straight or slightly curved at apex, 7 to 15 lines long, 1 to 1¼ lines wide, scantily puberulent; seeds quadrate, usually irregularly rugulose, ¼ line broad.

Sandy soil, 5 to 2800 feet: along the coast from San Francisco to San Diego; Marysville Buttes; Sierra Nevada foothills from Amador Co. to Kern Co.; cismontane Southern California; west margins of Colorado Desert in San Diego Co. Apr.-May.

Locs.—South Coast Ranges: Antioch, *Chesnut & Drew;* San Francisco, *Jepson* 2632; Santa Cruz, *Jones;* Carmel, *Ottley* 1261; San Carpojo, San Luis Obispo Co., *Condit;* Estrella, San Luis Obispo Co., *Jared.* Marysville Buttes: Butte Pass, *Jepson* 13,807. Sierra Nevada foothills: White Bar, Amador Co., *Hansen* 1317; Rattlesnake Gulch, e. of Friant, Fresno Co., *Jepson* 15,130; Kaweah, *W. Fry* 108. Tehachapi Mts.: Rowen, *Jepson* 6721; Keene sta., *Heller* 7820. S. Cal.: Santa Maria, *Summers;* Randsburg, Mohave Desert, *Heller* 7684; Bagdad, Mohave Desert, *Forrest Shreve;* Simi Valley, Ventura Co., *Jepson* 8466; Santa Catalina Isl. (Erythea 7:144); Rubio Cañon, San Gabriel Mts., *Peirson* 97; Arroyo Seco Cañon, San Gabriel Mts., *Peirson* 351; Henniger Flats, San Gabriel Mts., *Peirson;* San Bernardino, *Parish;* Riverside, *Jepson* 1227; Anaheim, *Alice King;* La Jolla, *Jepson* 11,866; San Diego, *Will S. Wright* 5; La Mesa, San Diego Co., *Jepson* 6693; Wagon Wash near Sentenac Cañon, e. San Diego Co., *Jepson* 8771, 12,467; Blair Valley, e. San Diego Co., *Jepson* 8677a.

Var. hirtellus Ottley. Hirsutulous, the hairs spreading; leaves 3 to 8 lines long; leaflets cuneate-oblanceolate, obovate or oblong, obtuse, thickish; flowers 4 to 5½ lines long; pods 1 to 1½ lines wide, usually somewhat constricted between the seeds; seeds larger than in the species.—Arid situations, mainly in the pine belt on ridges, 3000 to 6000 feet: Tuolumne Co. to coastal Southern California. South to Lower California. Apr.-Oct.

Locs.—Hetch-Hetchy; Snow Creek trail, Yosemite, *Jepson* 10,501; San Antonio trail near Twin Peak, Santa Lucia Mts., *Jepson* 1658; Richardson Cañon, Antelope Valley, *Davy* 2500; Newhall, *Jepson* 8923; Mt. Lowe, San Gabriel Mts., *Ottley* 644; Mt. Wilson, *Ottley* 649; Chalk Hill, Mt. San Jacinto, *Jepson* 1314; Vandeventer Ranch, Santa Rosa Mts., *Jepson* 1426a; Palomar Mt., *Esther Hewlett* 2.

Refs.—Lotus strigosus Greene, Pitt. 2:141 (1890); Jepson, Fl. W. Mid. Cal. 302 (1901), ed. 2, 230 (1911), Man. 551 (1925). *Hosackia strigosa* Nutt.; T. & G. Fl. 1:326 (1838), type loc. near Monterey, *Nuttall*. *Anisolotus strigosus* Hel. Muhl. 3:101 (1907). *Hosackia nudiflora* Nutt. l.c. type loc. near Monterey, *Nuttall* (dwarf form). *L. nudiflorus* Greene, l.c. *L. strigosus* var. *nudiflorus* Jepson, Fl. W. Mid. Cal. 302 (1901), ed. 2, 230 (1911). *Anisolotus nudiflorus* Hel. l.c. *Hosackia rubella* Nutt. l.c., type loc. near Monterey, *Nuttall* (small-flowered). *L. rubellus* Greene, l.c. *Anisolotus rubellus* Hel. Muhl. 7:139 (1912). Var. hirtellus Ottley, Univ. Cal. Publ. Bot. 10:214 (1923); Jepson, Man. 551 (1925). *L. hirtellus* Greene, l.c. 142, type loc. mts. n. of Hetch-Hetchy Valley, *Chesnut & Drew*. *Hosackia strigosa* var. *hirtella* Hall, Univ. Cal. Publ. Bot. 4:199 (1912). *Anisolotus hirtellus* Hel. Muhl. 8:60 (1912).

13. **L. tomentellus** Greene. Desert Lotus. Stems branching from the base, prostrate, 3 to 9 inches long; herbage pubescent or subglabrous, the young parts villous-canescent; leaves a little succulent, 5 to 7 (or 11) lines long; leaflets 4 to 6, obovate or orbicular-spatulate, 2 to 5 lines long; peduncles 1 to 10 lines long; umbels 1 or 2-flowered; flowers 3 to 4 lines long; calyx villous, its teeth lanceolate, ⅓ to ¾ as long as the tube; corolla lemon-yellow; pods a little curved, 7 to 10 lines long, 1 line wide, puberulent; seeds globose or oblong.

Washes and mesas, 100 to 4000 feet: Death Valley region; eastern Mohave Desert; Colorado Desert. East to Arizona, south to Lower California. Mar.-May.

Lotus tomentellus is very close in both aspect and technical character to L. strigosus Greene. It seems probable that its sounder disposition will finally be found as a varietal subordinate of that species.

Locs.—Hanaupah Cañon, Panamint Range, *Jepson* 7061; Goffs, e. Mohave Desert, *Newlon* 539; Cañon Sprs., Colorado Desert, *Hall* 5853; Painted Cañon, n. of Mecca, *Jepson* 11,639; Borrego Sprs., w. Colorado Desert, *T. Brandegee;* Vallecito, e. San Diego Co., *Jepson* 8543; Coyote Well, sw. Colorado Desert, *Newlon* 395.

Refs.—Lotus tomentellus Greene, Pitt. 2:140 (1890), type loc. Los Angeles Bay, L. Cal., *Palmer* 602; Jepson, Man. 551, fig. 542 (1925).

14. **L. salsuginosus** Greene. Alkali Lotus. Stems many from the root-crown, decumbent, spreading or suberect, 4 to 14 inches long; herbage scantily strigulose; leaves slightly succulent, ½ to 1½ inches long, the rachis flattened; leaflets 5 to 8, obovate to orbicular, 2 to 6 lines long; peduncles ¾ to 1¾ inches long; umbels 2 to 5-flowered, with a bract of 1 to 3 ovate or orbicular leaflets; flowers 3 to 5 lines long; calyx-teeth broadly subulate or linear-lanceolate, 1 to 2 times as long as tube; corolla yellow; keel obtuse; pods slender, 10 to 12 lines long, ⅔ line wide.

Alkaline flats or clay hills, 500 to 3200 feet: near the coast from Santa Clara Co. to San Diego Co. South to Lower California. Mar.-July.

Locs.—South Coast Ranges: Lime Kiln Creek, Santa Lucia Mts., *Jepson* 1677; Cuyama Valley, s. San Luis Obispo Co., *Jepson* 12,160. Southern California: Pelican Bay, Santa Cruz Isl., *Jepson* 12,090; Castaic Creek (mts. above), Los Angeles Co., *Jepson* 8934; Santa Catalina Isl. (Erythea 7:144); Rubio Cañon, San Gabriel Mts., *Peirson* 94; Fish Cañon, San Gabriel Mts., *Ottley* 605.

Var. **brevivexillus** Ottley. Small, prostrate; peduncles shorter than the leaves; flowers 1½ to 2 lines long; banner and wings shorter than the keel; pods 5 to 6 lines long, constricted between the seeds.—Sandy and gravelly mesas, detrital fans or washes: Death Valley; Colorado Desert. Arizona to Mexico and Lower California. Mar.-May.

Locs.—Hanaupah Cañon, Panamint Range, *Jepson* 7061a; San Francisquito Cañon, w. side Mohave Desert, *Parish* 1891 (flowers 3 lines long); Painted Cañon, n. of Mecca, *Jepson* 11,640. Eastern San Diego Co.: San Felipe Narrows, *Jepson* 12,528; Wagon Wash near Sentenac Cañon, *Jepson* 8771a; Vallecito, *Jepson* 8545; Myers Creek bridge, foot of Mountain Sprs. grade, *Jepson* 11,790.

Refs.—Lotus salsuginosus Greene, Pitt. 2:140 (1890); Jepson, Fl. W. Mid. Cal. 301 (1901), ed. 2, 230 (1911), Man. 551 (1925). *Hosackia maritima* Nutt.; T. & G. Fl. 1:326 (1838), type loc. Santa Barbara, *Nuttall;* not Lotus maritimus L. (1753). *Anisolotus maritimus* Hel. Muhl. 8:48 (1912). Var. brevivexillus Ottley, Univ. Cal. Publ. Bot. 10:217 (1923); Jepson, Man. 551 (1925). *L. humilis* Greene, Pitt. 2:140 (1890), type loc. San Bartolomé Bay, L. Cal., *Pond;* not L. humilis Schousb. (1878).

15. **L. micranthus** Benth. Hill Lotus. Stems slender, wiry, erect or diffusely branched from the base, 2 to 9 (or 14) inches high; herbage glabrous and glaucous; leaves 2 to 8 lines long; rachis of leaf slender, grooved on the upper side; leaflets 3 to 5, oblong, obovate or elliptical, obtuse, 1 to 6 lines long; peduncles filiform, 1½ to 11 lines long, 1-flowered; bract with 3 leaflets; flowers 2 to 2½ lines long; calyx turbinate-campanulate; corolla pale salmon, turning red; banner short-oblong to nearly orbicular; keel acute; pods linear, flattened, straight or nearly so, constricted between the seeds, 5 to 12 lines long, ¾ to 1 line wide; seeds 5 to 9, suborbicular to short-oblong.

Open grassy or wooded hills or clay flats, 20 to 4600 feet: coastal Southern California; Coast Ranges from San Luis Obispo Co. to Del Norte Co.; upper Sacramento Valley; Sierra Nevada from Tulare Co. to Shasta Co. North to Washington. Apr.-May.

Field note.—Lotus micranthus is the most common of the annual vernal Loti on the grassy foothills and very widely distributed. It is usually found in little colonies 10 to 20 feet broad with the individuals forming a very dense growth.

Locs.—S. Cal.: Cuyamaca Lake, *Peirson* 5963; Mesa Grande, San Diego Co., *E. Ferguson* 38; Monrovia Cañon, San Gabriel Mts., *Peirson* 436; Santa Cruz Isl., *T. Brandegee.* Coast Ranges: Paso Robles, *Barber* 1024; Pacific Grove, *Heller* 6671; Santa Cruz, *Jones* 2266; Lake Pilarcitos, San Mateo Co., *Davy* 1156; San Francisco, *Jepson* 10,360; Fish Ranch, Berkeley Hills, *Jepson* 13,788; Mt. Diablo, *Brewer* 1173; Fairfax, Marin Co., *Ottley* 339; Olema, Marin Co., *Jepson* 13,785; Howell Mt., Napa Range, *Jepson* 13,787; Bodega, Sonoma Co., *Chandler* 651; Ft. Bragg, *W. C. Mathews* 118; Willits, Mendocino Co., *Jepson* 2499; Mail Ridge, Humboldt Co., *Jepson* 1900; Little River (mouth), Humboldt Co., *Tracy* 4795; Weaverville, *H. S. Yates* 286; Sisson, *K. Brandegee;* Crescent City. Upper Sacramento Valley: Marysville Buttes, *Heller* 11,271; Dibble Creek, w. Tehama Co., *Jepson* 13,786; Redding, *Blankinship.* Sierra Nevada foothills: Middle Tule River, *Peirson* 5628; Kaweah, *Hopping* 172; Pinehurst, Fresno Co., *Ottley* 1393; Chowchilla School, Mariposa Co. foothills, *Jepson* 12,806; Jupiter, Tuolumne Co., *A. L. Grant* 776; Gwin Mine, Calaveras Co., *Jepson* 1809; Folsom, e. Sacramento Co., *Jepson* 15,740; Auburn, *M. E. P. Ames.*

Refs.—Lotus micranthus Benth. Trans. Linn. Soc. 17:367 (1837); Jepson, Fl. W. Mid. Cal. 302 (1901), ed. 2, 230 (1911), Man. 552, fig. 543 (1925). *Hosackia parviflora* Benth.; Lindl. Bot. Reg. sub t. 1257 (1829), type from "Northwest coast of America," *Douglas;* not Lotus parviflorus Desf. (1800). *Anisolotus parviflorus* Hel. Muhl. 3:100 (1907).

16. **L. americanus** Bisch. Spanish Clover. Stems branching, erect or ascending, ¼ to 1½ feet high, sometimes strictly erect, sometimes diffuse, with straggling or ascending branches 2 to 3 feet long; herbage silky-villous or pilose to nearly glabrous; leaflets 3, sometimes 1, sometimes 4 or 5, elliptic-ovate to lanceolate, 3 to 14 lines long; peduncles exceeding the leaves or shorter, 5 to 10 lines long; flowers 3 to 3½ lines long; calyx-teeth subulate-lanceolate; corolla whitish or pinkish; pods 7 to 14 lines long, 1 to 1¼ lines wide, glabrous, 3 to 7-seeded.

Dry valley fields and open hills, 20 to 4500 feet: throughout cismontane California, occasional in the transmontane region. North to Washington, northeast to Minnesota, southeast to Texas and Mexico. May-Oct.

Field note.—Lotus americanus is the most widely distributed and the most common species of its genus in California, inhabiting low open hills, banks of arroyos, swales in the foothills, and level lands of plains and valleys where it often forms colonies in half-moist areas or depressions. In the dry summer fields it is often the only flowering plant in its favored place and season. It is a forage plant of some value.

Locs.—Coast Ranges: Sisson, Siskiyou Co., *Jepson* 13,777; Rush Creek, Trinity Co., *H. S. Yates* 429; Big Lagoon, n. Humboldt Co., *Tracy* 6271; Dows Prairie, Humboldt Co., *Tracy* 6266; White Thorn Valley, s. Humboldt Co., *Tracy* 5015; Long Valley, Mendocino Co., *Jepson* 9322; Hopland, Mendocino Co., *Jepson* 7642; Mt. Konocti, Lake Co., *Jepson* 13,776; Moraga Valley, Contra Costa Co., *Jepson* 13,778; Mt. Diablo, *Jepson* 8333; Milpitas, Santa Clara Co., *R. J.*

Smith; Coyote, Santa Clara Co., *Jepson* 6203; Los Gatos, *Heller* 7526; Jolon, Monterey Co., *Brewer* 559; Paso Robles, *Barber.* Great Valley: Anderson, Shasta Co., *Blankinship;* Chico, *H. A. Dutton;* Stockton, *Sanford;* Alamo Creek, Vaca Valley, *Jepson* 13,775. Sierra Nevada: Auburn, *Shockley;* Five-mile Creek, South Fork Stanislaus River, *A. L. Grant* 732; Greely Hill, Mariposa Co., *Jepson* 13,779; Hetch-Hetchy, *Jepson* 3409; Toll House, Fresno Co.; Kaweah, *Hopping* 281; Middle Tule River, *Purpus* 5623. Mohave Desert: Daggett (Camp Cady), *Cooper.* S. Cal.: Ojai Valley, *Olive Thacher* 20; Cienega, Los Angeles, *Braunton* 626; Claremont, *Chandler;* Cajon Cañon, *N. C. Wilson;* San Bernardino Valley, *Parish;* Hemet Valley, *Munz* 5968; Mesa Grande, San Diego Co., *E. Ferguson* 101; Witch Creek, San Diego Co., *Alderson.*

Var. glaber Ewan comb. n. Decumbent, less robust than the species, pilose to nearly glabrous; peduncles longer or shorter than the leaves; flowers 2 to 2½ lines long.—Higher altitudes (4500 to 6500 feet), except along the coast; a reduced form.

Locs.—Coast Ranges: Crescent City, *Davy* 5945b; Eureka, *Tracy* 3536; Fort Bragg, *Ottley* 1552; Mt. Konocti, Lake Co., *Jepson* 13,780. Sierra Nevada: Martin Sprs., Eagle Lake., *Brown & Wieslander* 89; Bear Valley, Nevada Co., *Jepson* 13,781; Tallac, Eldorado Co., *Ottley* 1200; Kennedy Mdw., Tuolumne Co., *A. L. Grant* 893; Mono Mdws., Mono Creek, South Fork San Joaquin River, *E. Ferguson* 414; Lower Hot Sprs., South Fork San Joaquin River, *Jepson* 13,226; Jackass Mdw., South Fork San Joaquin River, *Mainwaring* 511; Markwood Mdw., Fresno Co., *Jepson* 16,037; Simpson Mdw., Middle Fork Kings River, *Henrietta Eliot;* Kings Cañon, *Ottley* 1485.

Refs.—LOTUS AMERICANUS Bisch. Del. Sem. Hort. Heidelb. (1839); Jepson, Fl. W. Mid. Cal. 302 (1901), ed. 2, 231 (1911), Man. 553 (1925). *Trigonella americana* Nutt. Gen. 2:120 (1818), a new name for Lotus sericeus Pursh. *Hosackia americana* Piper, Contrib. U. S. Nat. Herb. 11:366 (1906). *L. sericeus* Pursh, Fl. 489 (1814), type loc. "banks of the Missouri"; not Lotus sericeus Moench (1802). *Acmispon sericeum* Raf. Atl. Jour. 1:145 (1832). *Hosackia purshiana* Benth.; Lindl. Bot. Reg. sub t. 1257 (1829), a new name for Lotus sericeus Pursh. *L. purshianus* Clements & Clements, Rocky Mtn. Fls. 183 (1914). *Hosackia unifoliata* Hook. Fl. Bor. Am. 1:135 (1830), type loc. shores of the Columbia River, *Scouler. Lotus? unifoliatus* Benth. Trans. Linn. Soc. 17:368 (1837). *Hosackia elata* Nutt.; T. & G. Fl. 1:327 (1838), type loc. "gravelly bars of the Wahlamet and Oregon", *Nuttall. Hosackia floribunda* Nutt. l.c., type loc. "plains of Rocky Mt. range toward the Oregon," *Nuttall* (flowers numerous, almost sessile, ex char.). *H. mollis* Nutt. l.c., type loc. "Wahlamet near the Falls", *Nuttall* (hirsute with spreading hairs; peduncles exceeding leaves, ex char.). *Acmispon mollis* Hel. Muhl. 9:62 (1913). *A. gracilis* Hel. l.c. 61, type loc. near Burke's Sanatorium, Sonoma Co., *Heller* 5745 (plant glabrous or nearly so; peduncles exceeding leaves). *A. sparsiflorus* Hel. l.c. 63, type loc. Russian River near Cloverdale, *Heller* 5834 (plant erect, few-flowered; peduncles shorter than leaves flowers 3½ lines long). *A. aestivalis* Hel. l.c., type loc. Santa Rosa, Sonoma Co., *Heller* 6051 (plant decumbent, many-flowered; peduncles shorter than leaves; flowers 3½ lines long; late flowering). Var. GLABER Ewan. *Hosackia elata* var. *glabra* Nutt.; T. & G. Fl. 1:327 (1838), type loc. "gravelly bars of the Wahlamet and Oregon", *Nuttall. Acmispon glabratus* Hel. Muhl. 9:65 (1913), type loc. Donner Lake, *Heller* 7019 (plant glabrous; flowers few; leaves 6 to 7½ lines wide). *Hosackia pilosa* Nutt. l.c., type loc. "gravelly bars of the Wahlamet and Oregon", *Nuttall* (densely clothed with soft hairs, ex char.). *Acmispon pilosus* Hel. l.c. 64. *L. americanus* var. *minutiflorus* Ottley, Univ. Cal. Publ. Bot. 10:220 (1923); Jepson. Man. 553 (1925).

17. **L. denticulatus** Greene. NORTH LOTUS. RIVER-BAR LOTUS. Stem erect, branching at the base or above the middle, 1 to 2 feet high; branches few and coarse; herbage pale green, mainly glabrous or scantily villous, especially on the leaves or younger parts; leaves 5 to 13 lines long; leaflets 4, elliptic-obovate, 4 to 10 lines long; flowers solitary in the axils, 2 to 3 lines long, on pedicels ¼ to ½ line long; calyces villous, calyx-teeth subulate, longer than the tube, sometimes denticulate, as sometimes also the margins of the leaflets; corolla whitish, or pink- or lilac-tinged; keel beaked, yellowish; pods tan-color, flattish, 4 to 10 lines long, 1½ to 2 lines wide.

Open hill slopes or gravelly stream beds, 2500 to 4000 feet: northern Sierra Nevada from Butte Co. to Modoc Co.; North Coast Ranges from Lake Co. to Siskiyou Co. North to British Columbia. May-June.

Locs.—Northern Sierra Nevada: Chico, *Heller* 11,342; Fort Bidwell, *Manning* 463; Egg Lake, w. Modoc Co., *Baker & Nutting.* North Coast Ranges: Witter Sprs., n. Lake Co., *Elizabeth Taylor;* Mail Ridge, s. Humboldt Co., *Jepson* 1882; Hydesville, Humboldt Co., *Tracy* 1240; Kneeland Prairie, Humboldt Co., *Tracy* 3845; Yreka, *Butler* 389, 912.

Refs.—LOTUS DENTICULATUS Greene, Pitt. 2:139 (1890); Jepson, Man. 552 (1925). *Hosackia denticulata* Drew, Bull. Torr. Club 16:151 (1889), type loc. along Mad River near Jarnigan's, Humboldt Co., *Chesnut & Drew. Anisolotus denticulatus* Hel. Muhl. 7:139 (1912).

18. **L. humistratus** Greene. COLCHITA. Stems few or several from the base, prostrate to ascending, diffusely branched, forming mats 3 to 14 inches wide; herbage densely villous or sometimes only slightly so; leaves 3½ to 8½ lines long, with 2 leaflets terminal and 2 on one side of the flattened rachis and none on the other; leaflets oblanceolate to obovate, 1½ to 5 lines long; flowers 3 to 4 lines long, solitary in the axils, on pedicels ½ line long or less or sessile; calyx-teeth linear-acuminate, 1¼ to 2 times as long as the tube; corolla yellow; pods oblong, commonly straw-color, 3½ to 5 lines long; seeds 2 to 5, mostly 3.

Dry clay or rocky hillsides, 100 to 2800 (or 6500) feet: Coast Ranges from Humboldt and Trinity Cos. to San Luis Obispo Co.; Great Valley; Sierra Nevada foothills from Siskiyou Co. to Tulare Co.; Mohave Desert and desert slopes of mountains on its west borders; Colorado Desert; Inyo Co. North to southern Oregon, east to New Mexico. Apr.-May.

Field note.—Next to Lotus subpinnatus, L. humistratus is the most frequent spring-time annual of this genus everywhere in the Coast Range hills. Sometimes it is found on gravel or sand bars in the flood beds of streams or in cañon bottoms, and favors especially broken ground, such as landslips, in the hills. It is on the whole infrequent on the plain of the Great Valley, or at least rarely collected, and appears infrequent, too, in the Sierra Nevada foothills, though here the records are scanty. It is, however, abundant in the low foothills of Fresno Co. In that region we were told in 1929 by cattle men that this plant had become abundant during the previous four years. Stock do not eat it when other forage is available. In parts of the great expanse of the Mohave Desert it is often widespread and abundant. Apparently it is wholly absent from cismontane Southern California south of the San Gabriel Mts. and west of the San Jacinto Mts.

Its range, as to area of abundance, is ecologically very remarkable, since it extends from New Mexico westward to the Mohave Desert, regions of great aridity, to Mt. Pinos, thence northward through the South Coast Ranges into the North Coast Ranges, forming in the latter region a broad band inside the Redwood belt, a relatively humid region. Notwithstanding this wide distribution, Lotus humistratus is subject to an extremely slight range of variation.

Locs.—Coast Ranges: Weaverville (n. of), *H. S. Yates* 302; Hupa, *Chandler* 1308; Mail Ridge, Humboldt Co., *Jepson* 1897; Alder Sprs. grade, w. Glenn Co., *Heller* 11,465; South Mill Creek, Ukiah, *Jepson* 9231; Stanton (mts. e. of), ne. Lake Co., *Jepson* 8981; Jerusalem Valley, s. Lake Co., *Jepson* 9035; Mt. St. Helena, *C. F. Baker* 2605; Dutton Cañon, Vaca Mts., *Jepson* 13,812; Hood's Peak, Sonoma Co., *Michener & Bioletti;* Ross Valley, Marin Co., *Jepson* 13,810; Lake Temescal, Oakland Hills, *Jepson* 13,815; Mt. Diablo, *Brewer* 1073; Wrights sta., Santa Cruz Mts., *Jepson* 13,813; Paso Robles, *Barber;* San Carpoforo, San Luis Obispo Co., *Condit;* Estrella, San Luis Obispo Co., *Jared.* Northern Sacramento Valley: Redding, *Blankinship;* Crane Creek, w. Tehama Co., *Jepson* 13,814; Chico, *R. M. Austin.* Sierra Nevada: Goosenest foothills, e. Siskiyou Co., *Butler* 911; betw. Clear Creek and Paradise, Butte Co., *Heller* 11,377; Auburn, *Shockley;* Copperopolis, Calaveras Co., *Davy* 1339; Columbia, Tuolumne Co., *A. L. Grant* 682; Rattlesnake Gulch, e. of Friant, Fresno Co., *Jepson* 15,133; Kaweah, *Hopping* 279. Mt. Pinos, n. Ventura Co., *Hall* 6532. Colorado Desert: Sentenac Cañon, e. San Diego Co., *Jepson* 12,460. Mohave Desert: Arrastre Cañon, n. side San Gabriel Mts., *Peirson* 406; Hesperia, *Jepson* 6141; Stoddard Well, *Jepson* 5914; Piute Creek, e. Mohave Desert, *N. C. Wilson.* Inyo Co.: Independence, *Hall & Chandler* 7299; Argus Mts., *Purpus* 5420.

Refs.—LOTUS HUMISTRATUS Greene, Pitt. 2:139 (1890); Jepson, Fl. W. Mid. Cal. 303 (1901), ed. 2, 231 (1911), Man. 552 (1925). *Hosackia brachycarpa* Benth. Pl. Hartw. 306 (1848), type (*Hartweg* 391) collected "in the Sacramento mountains", that is, in the Yuba River region (Erythea 5:55); not Lotus brachycarpus Hochstetter & Steudel (1841). *Anisolotus brachycarpus* Rydb. Bull. Torr. Club 33:144 (1906). *L. trispermus* Greene, Erythea 1:258 (1893), type loc. Lancaster, Los Angeles Co., *Davidson* (calyx-lobes subulate, seeds quadrangular). *Anisolotus trispermus* Woot. & Sta. Contrib. U. S. Nat. Herb. 16:135 (1913).

19. **L. subpinnatus** Lag. CALF LOTUS. Stem diffusely branched, 4 to 9 inches high; herbage pubescent (or the young parts whitish-hairy) to subglabrous; leaves 3 to 8 lines long, with 2 or 3 leaflets terminal, 2 on one side of the flattened rachis, none on the other; leaflets elliptic, 2 to 5 lines long; flowers 3 to 4½ lines long, solitary in the axils on pedicels ¼ to ½ line long; calyx-teeth broadly subulate, as long as the tube; corolla bright yellow; pods oblong to linear, puberulent, 5 to 10 lines long, 3 to 7-seeded.

Clay or sandy hillsides and plains, 20 to 2500 feet: throughout cismontane California, often growing with L. humistratus. Mar.-Oct.

Locs.—Cismontane S. Cal.: San Diego, *Jones* 3162; Witch Creek, San Diego Co., *Alderson;* Upland, *Parish* 11,169; Arroyo Seco, Pasadena, *Ottley* 636; Santa Monica, *Barber;* Santa Barbara, *Eastwood;* Prisoners Harbor, Santa Cruz Isl., *Jepson* 12,063; Purisima Hills, Santa Barbara Co., *Jepson* 12,650. Tehachapi Mts.: Lebec near Tejon Pass, *Jepson* 12,424. Coast Ranges: Cambria, San Luis Obispo Co., *Condit:* Carmel River, *Ottley* 1281; San Juan, San Benito Co., *Elmer* 5024; Coyote, Santa Clara Co., *Davy* 106; Belmont, San Mateo Co., *Elmer* 4741; Livermore Valley, *Davy;* Mt. Diablo, *Jepson* 13,796; San Francisco, *Jepson* 13,792; North Berkeley Hills, *Jepson* 9636; Mt. Tamalpais, *Jepson* 7559; Fairfax, Marin Co., *Ottley* 360; Bodega Bay, *Chandler* 719; Ukiah, *Purdy;* Hydesville, Humboldt Co., *Tracy* 2521; Trinidad, Humboldt Co., *Tracy* 2697. Great Valley: Bakersfield, *Davy* 1754; Patterson, w. Stanislaus Co., *Jepson* 11,569; Sacramento, *Shockley* 399; South Peak, Marysville Buttes, *Jepson* 13,793; Red Bluff, *Jepson* 13,794. Sierra Nevada: Lindsay, Tulare Co., *Munz* 9080; Badger, Tulare Co., *Ottley* 1413; Knights Ferry, Stanislaus Co. (Univ. Cal. Publ. Bot. 10:223); French Flat, Tuolumne Co. (Univ. Cal. Publ. Bot. 10:223); Mokelumne Hill, Calaveras Co. (Univ. Cal. Publ. Bot. 10:223); Oroville (foothills n.), *Heller* 11,238.

Refs.—Lotus subpinnatus Lag. Gen. et Sp. Pl. 23 (1816), type loc. Talcahuano, Chile; Jepson, Man. 552, fig. 544 (1925). *Hosackia subpinnata* T. & G. Fl. 1:326 (1838). *L. wrangelianus* F. & M. Ind. Sem. Hort. Petrop. 41:16 (1835), type loc. Bodega Bay. *Hosackia wrangeliana* T. & G. l.c. (herbage sparsely hirsute). *L. subpinnatus* var. *wrangelianus* Jepson, Fl. W. Mid. Cal. 303 (1901), ed. 2, 231 (1911).

20. **L. nuttallianus** Greene. Wire Lotus. Stems several to many from the root-crown, wiry, prostrate, ⅓ to 2⅓ feet long; tips of the branchlets hoary, the stems soon glabrate and the leaves nearly so; leaves 3 to 7 lines long; leaflets 5 to 7, cuneate- to oblong-oblanceolate, acute or obtuse, 1 to 2½ lines long; peduncles 2 to 6 lines long, equaling or exceeding the leaves, becoming 5 to 17 lines in fruit; umbels 3 to 7-flowered; bract mostly of 1 small leaflet, rarely none; flowers 2½ to 3½ lines long, the calyx less than half as long; calyx-teeth triangular, about ⅓ as long as the tube; corolla yellow, turning reddish; pods several times as long as the calyx, slender, eccentrically sickle-shaped, the body about 3 to 5 lines long, above the middle tapering into the curved style which is 1 to 1½ lines long, constricted between the two seeds, slightly canescent.

Sandy lands, 50 to 100 feet: along the coast, San Diego Co. South to Lower California. Apr.-June.

Locs.—La Jolla, *Jepson* 11,865; Del Mar, *Jepson* 1602a; Coronado Beach, *Berg.*

Refs.—Lotus nuttallianus Greene, Pitt. 2:150 (1890); Jepson, Man. 555 (1925). *Hosackia prostrata* Nutt.; T. & G. Fl. 1:325 (1838), type loc. "San Diego and Santa Barbara," *Nuttall;* not Lotus prostratus L. (1762). *Syrmatium prostratum* Greene, Bull. Cal. Acad. 2:147 (1886). *Hosackia decumbens* var. *glabriuscula* H. & A. Bot. Beech. 137 (1832), type from Cal., *Douglas.*

21. **L. hamatus** Greene. Grab Lotus. Stems prostrate or trailing, several from the base, simple or sparingly branched, ½ to 1½ feet long; herbage glabrous or the leaves and young parts puberulent; leaves 4 to 6 lines long; leaflets 4 to 6, oblanceolate to obovate, often mucronate, 2 to 3½ lines long; umbels sessile or nearly so, bractless; flowers 1¼ to 2¼ lines long; calyx-teeth subulate, ½ as long as tube; pods slender, abruptly upturned above the base and attenuate into the coiled style (hooked beak), the body about 3 to 4 lines long, the beak nearly as long; pericarp with wavy v-shaped markings.

Washes, clay flats or dry mesas, 50 to 1500 feet: cismontane Southern California. South to Lower California. May-June.

Locs.—Santa Catalina Isl., *Davidson;* Tujunga Wash, *Peirson* 2117; San Bernardino Valley, *Parish* 11,211; Jamacha, San Diego Co., *Chandler* 5271; San Diego, *Will S. Wright* 37, 132.

Refs.—Lotus hamatus Greene, Pitt. 2:150 (1890); Jepson, Man. 555, fig. 546 (1925). *Hosackia micrantha* Nutt.; T. & G. Fl. 1:324 (1838), type loc. Monterey, *Nuttall;* not L. micranthus Benth. (1837). There are also two isotypes of Hosackia micrantha Nutt. in the Kew Herbarium (Herb. Hook.), with labels in Nuttall's hand, one from Santa Barbara, *Nuttall,* the other from Santa Catalina Isl.; cf. Jepson, Californian Types at Kew, 76 (ms.).

22. **L. leucophyllus** Greene. Hoar Lotus. Stems ascending, decumbent or prostrate, much-branched, rigid, 8 to 22 inches long, slightly woody at base; herbage whitish-pubescent or the leaves white-silky; leaves 4 to 9 lines long; leaflets 3,

approximate, narrowly obovate to oblanceolate, acute, 2 to 7 lines long; umbels 1 or 2-flowered, sessile; flowers 3 to 4 lines long; calyx-teeth narrowly linear, ¼ to ½ as long as the tube; corolla yellow, the claws of the petals exserted; pods slender, moderately attenuate, a little straightened or strongly curved, pubescent, brown when mature, deflexed, much exceeding the calyx, 4 to 6 lines long; seeds 2 to several.

Dry sandy soil of flats or slopes in the foothills and mountains, 1000 to 7500 feet: Monterey and San Benito Cos. to the San Gabriel and San Bernardino mountains; east to Inyo Co. Apr.-July.

Locs.—Chalone Creek, San Benito Co., *Hall* 9963; Mission San Antonio, Monterey Co., *Jepson* 1666; Templeton, San Luis Obispo Co., *Barber;* Griffins, Mt. Alamo, *Elmer* 3988; Mt. Pinos, *Hall* 6494, 6536; Tejon Pass, *Hall* 6264; Frazier Mt., n. Ventura Co., *Hall* 6603; Brook Glen, Tehachapi Peak, *Dudley* 324a; Manzana, Antelope Valley, *Davy* 2502; Cajon Pass, *Parish, Peirson* 101; Argus Mts., Inyo Co., *Purpus* 5465; Independence, *Alice Rhine.*

Var. **jepsonii** Ottley. Umbels 1 or 2-flowered; flowers 4½ to 6 lines long; calyx-teeth 1¼ lines long, more than half the length of the tube; claws of the petals scarcely exserted.—Gravelly ridges, 6000 to 6300 feet: southern Sierra Nevada in Tulare and Kern Cos. July.

Locs.—Trout Mdws., *Purpus* 1856; Greenhorn Mts., *Purpus* 5533.

Refs.—Lotus leucophyllus Greene, Pitt. 2:149 (1890); Jepson, Man. 554 (1925). *Hosackia sericea* Benth. Trans. Linn. Soc. 17:367 (1837), type from Cal., *Douglas;* not Lotus sericeus Moench (1802). *Syrmatium sericeum* Greene, Bull. Cal. Acad. 2:147 (1886). *Hosackia procumbens* Greene, l.c. 1:82 (1885), type loc. Tehachapi, Kern Co., *Curran. Syrmatium procumbens* Greene, l.c. 2:148. *L. procumbens* Greene, Pitt. 2:149 (1890). Var. jepsonii Ottley, Univ. Cal. Publ. Bot. 10:227 (1923), type loc. Kern River near Little Kern Lake, *Jepson* 4921; Jepson, Man. l.c.

23. **L. argophyllus** Greene. Silver Lotus. Stems several to many from the woody base, slender, decumbent, 2 to 6 feet long; herbage silvery-tomentose, the tomentum denser and more silky on the leaves and calyces; leaves 2½ to 7½ lines long; leaflets 3 to 5, roundish-obovate, 2 to 5 lines long; umbels 3 to 8-flowered, nearly sessile, 4 to 7 lines wide; bract of 1 leaflet, commonly present; flowers 4 to 5 lines long; pedicels short, hidden by the pubescence; calyx-teeth obscured by the pubescence, about half the length of the tube; corolla yellow, the banner aging brown or purple; ovary with 2 to 4 ovules; pods silky, slightly longer than the calyx, nearly straight, attenuately beaked, mostly clearly keeled, 1 (or 2)-seeded, the body 2 to 2½ lines long, the beak ½ to as long; seeds curved-oblong.

Foothills and plains, 1100 to 3500 feet: Monterey and Fresno Cos. to Southern California. Mar.-July.

Locs.—South Coast Ranges: Big Sur River, Monterey Co., *Davy* 7429; San Antonio trail summit, Santa Lucia Mts., *Jepson* 1654. Southern Sierra Nevada: Toll House, Fresno Co.; Switch-back, Kaweah River, *W. Fry* 323; Erskine Creek, Kern Co., *Purpus* 5052. S. Cal.: San Bernardino Mts., *Parish;* Deep Cañon, Santa Rosa Mts., *Clary* 1184; betw. Thomas Valley and Vandeventer ranch, San Jacinto Mts., *Jepson* 1331; Mesa Grande, San Diego Co., *E. Ferguson* 77; Cuyamaca Lake, *Peirson* 5977; Mountain Sprs. grade summit, e. San Diego Co., *Jepson* 11,822; Witch Creek, *Alderson;* San Diego, *M. F. Spencer* 89.

Var. **decorus** Ottley. Herbage glistening satiny-canescent throughout or only at tips of the branches; peduncles 1 to 4 lines long; umbels 3 to 5-flowered; pedicels more evident than in the species.—Foothills and mountains, 3000 to 7000 feet: San Gabriel Mts.; San Bernardino Mts. Apr.-July.

Locs.—Little Tujunga Wash, San Gabriel Mts., *Ottley* 565; Mt. Wilson, *Peirson* 95; San Bernardino Mts., *Parish;* San Bernardino Valley, *Parish* 4389.

Var. **fremontii** Ottley. Leaves 5 to 8 lines long, slightly longer than in the species; leaflets broadly oblanceolate or obovate to elliptical, acute, 2 to 7 lines long; umbels very dense, 7 to 9 lines broad, confined to the ends of the branches; calyx-teeth as long as the tube; blade of banner shorter than its claw.—Cañon sides, 1500 to 4000 feet: Sierra Nevada from Placer Co. to Mariposa Co. Occasional. May-July.

Locs.—Colfax, *Jones;* Cape Horn, Placer Co., *F. M. Essig;* Sweetwater Creek, Eldorado Co., *C. Simpson;* Yosemite Valley, *Chesnut & Drew.*

Var. **niveus** Ottley. Stems woody and stocky, characterized by short internodes; herbage white-silky; leaflets acute, 5 to 9 lines long; calyx-teeth as long as the tube, extending beyond the corolla.—Santa Cruz and San Clemente islands.

Var. **davidsonii** Jepson comb. n. Herbage bluish-green or silvery; peduncles 1½ to 11 lines long; flowers 2½ to 4 lines long; calyx-teeth ½ to ⅘ as long as tube.—Pine belt, 5000 to 9100 feet: San Gabriel and San Bernardino mountains; mountains of northern Ventura Co. May-Aug.

Locs.—Mt. Wilson, *Peirson* 96; Mt. Gleason, *Barber* 260; Bluff Lake, San Bernardino Mts., *Munz* 10,530; Glen Martin, San Bernardino Mts., *R. J. Smith;* Whitewater Basin, *C. M. Wilder* 1112; Mt. Pinos, *Hall* 6537.

Refs.—LOTUS ARGOPHYLLUS Greene, Pitt. 2:149 (1890); Jepson, Man. 554 (1925). *Hosackia argophylla* Gray, Mem. Am. Acad. n. ser. 5:316 (1854), type loc. Santa Isabel, *Thurber;* Trask, Erythea 7:139 (1899). *Syrmatium argophyllum* Greene, Bull. Cal. Acad. 2:147 (1886). *Hosackia argentea* Kell. Proc. Cal. Acad. 3:38, pl. 8 (1863), type loc. Kern River, *Hutchings.* Var. DECORUS Ottley, Univ. Cal. Publ. Bot. 10:237 (1923); Jepson, Man. l.c. *Hosackia argophylla* var. *decora* Jtn. Bull. S. Cal. Acad. 17:63 (1918), type loc. Cascade Cañon, fork of San Antonio Cañon, San Gabriel Mts., *Johnston* 1278. Var. FREMONTII Ottley, l.c.; Jepson, Man. l.c. *Hosackia argophylla* var. *fremontii* Gray, Proc. Acad. Phila. 15:347 (1863), type loc. "eastern side of the Sierra Nevada". *L. fremontii* Hel. Cat. N. Am. Pl. ed. 2, 7 (1900). *Syrmatium fremontii* Hel. Muhl. 9:67 (1913). Var. NIVEUS Ottley, l.c.; Jepson, Man. l.c. *Syrmatium niveum* Greene, Bull. Cal. Acad. 2:148 (1886), type loc. Santa Cruz Isl., *Greene. L. niveus* Greene, Pitt. 2:148 (1890). Var. DAVIDSONII Jepson. *L. sulphureus* Greene, Pitt. 2:293 (1892), type loc. Wilson's Peak, Los Angeles Co., *Davidson;* not Lotus sulphureus Boiss. (1843). *L. davidsonii* Greene, Erythea 1:207 (1893); Jepson, Man. l.c. *Syrmatium davidsonii* Hel. Muhl. 9:67 (1913).

24. **L. douglasii** Greene. PINE LOTUS. Stems slender, many from the branched root-crown, decumbent or prostrate, ⅓ to 2 feet long; herbage minutely pubescent; leaves 2½ to 6 lines long; leaflets 4 or 5, oblanceolate or obovate, mostly acute, 2 to 4½ lines long; umbels 4 to 7-flowered, sessile or on peduncles ½ to 7 lines long; bract of 1 or more leaflets or none; flowers 4½ to 6 lines long; calyx-teeth equaling the tube; corolla yellow, aging red; wings oblong, noticeably surpassing the keel; pods arcuate, attenuately beaked, mostly clearly keeled, canescent, extending well beyond the calyx-teeth, the body 2 lines long.

Dry rocky flats or mountain slopes, 2000 to 4000 feet: Sierra Co. to Shasta Co.; Mendocino Co. to Siskiyou Co. North to Washington and Idaho. May-July.

Locs.—Sierra Valley, *Lemmon;* Susanville, *T. Brandegee;* Big Valley, Lassen Co., *M. S. Baker;* Goose Valley, Shasta Co., *Baker & Nutting;* Yreka, *Heller* 8000; Travelers Home, e. Mendocino Co., *Cronemiller* 619.

Var. **nevadensis** Ottley. Branches wiry; flowers 2 to 3½ lines long; calyx-teeth ⅓ to ½ as long as the tube; wings equaling or exceeding the keel.—Dry sandy ridges and open flats of the mountain forests, 3500 to 7200 feet: Sierra Nevada, north to Siskiyou Co., south to mountains of Southern California. East to Nevada.

Field note.—This variety is a characteristic mat-like herb on the openly wooded ridges or slopes of the Pinus ponderosa belt of the Sierra Nevada. The trailing stems, radiating from the root-crown, tend to be simple. In the northern part of the state the variety is largely replaced by the species into which it insensibly merges. Indeed it is scarcely worth maintaining, since there is every gradation from the species to the variety in length of calyx-teeth, and in other features there is no constant character.

Locs.—Siskiyou Co.: Upton, near Mt. Shasta, *Jepson* 13,797; Yreka, *Butler* 392. Sierra Nevada: Bear Valley, Nevada Co., *Jepson* 13,801; Emerald Bay, Lake Tahoe, *Ottley* 1188; Meyers sta., Eldorado Co., *Ottley* 959; Kennedy Mdw., Tuolumne Co., *A. L. Grant* 916; Harden Ranch, Tuolumne Co., *Jepson* 10,565; Big Mdw., betw. Coulterville and Yosemite, *Jepson* 13,799; Royal Arches, Yosemite, *Jepson* 10,475; Alder Creek trail, Yosemite, *Jepson* 4322; Lake Merced, Merced River, *Jepson* 3196; Chowchilla School, Mariposa Co., *Jepson* 12,815; Arnold Mdw., Fresno Co., *A. L. Grant* 1391; McKinley Big Trees, Fresno Co., *Jepson* 16,008; Kings Cañon, *Jepson* 774; betw. Pinehurst and Badger, Fresno Co., *Ottley* 1407; Kern Lake, Kern Cañon, *Jepson.* S. Cal.: Strawberry Valley, Mt. San Jacinto, *Jepson* 2287.

Var. **congestus** Ottley. Branches shorter than in the species; more villous; internodes short; umbels dense, leafy-congested at the tips of the branches; leaflets narrowly rhomboidal or rhomboidal-obovate, acute at both ends.—Hill country, 1400 to 3600 feet: Lake Co. to Humboldt and Siskiyou Cos. May-July.

Locs.—Snow Mt., n. Lake Co., *T. Brandegee;* Asa Bean Ridge, ne. Mendocino Co., *Jepson* 13,800; Pilot Ridge, Humboldt Co., *Chesnut & Drew;* Buck Mt., Humboldt Co., *Tracy* 2913; Three Creeks to Willow Creek, n. Humboldt Co., *Jepson* 1979; Orleans Bar to Sommes Bar, Humboldt Co., *Chandler* 1487; Hayfork Mt., Trinity Co., *Tracy* 6441; Weaverville (n. of), *H. S. Yates* 300; Siskiyou Co. (Univ. Cal. Publ. Bot. 10:236).

Refs.—LOTUS DOUGLASII Greene, Pitt. 2:149 (1890); Jepson, Man. 553 (1925). *Hosackia decumbens* Benth.; Lindl. Bot. Reg. sub t. 1257 (1829), type from "Northwest coast of America", *Douglas;* not Lotus decumbens Poiret (1814). *L. incanus* Dougl.; Hook. Fl. Bor. Am. 1:134

(1830), as synonym. *Anisolotus decumbens* Armstrong & Thornber, Field Book Western Wild Fls. 244 (1915). Var. NEVADENSIS Ottley, Univ. Cal. Publ. Bot. 10:234 (1923); Jepson, Man. 553 (1925). *Hosackia decumbens* var. *nevadensis* Wats. Bot. Cal. 1:138 (1876), "Sierra Nevada from Yosemite to Sierra Co., *Lemmon.*" *H. heermannii* Wats. Bot. King 63 (1871), in part. *H. nevadensis* Parish, Pl. World 20:220 (1917). Var. CONGESTUS Ottley, l.c. 235, Tunis Mill, Lake Co., *T. Brandegee* (first spm. cited); Jepson, Man. l.c.; distinct from L. incanus Dougl., the type of which was examined at Herb. Kew, 1935.

25. **L. eriophorus** Greene. MAT LOTUS. Stems several to many from the root-crown, elongated, forming mats 1 to 5 feet wide; herbage gray- or rusty-villous; leaves on the main branches 5 to 14 lines long, often conspicuously larger than those on the secondary branches; leaflets 4 to 6, oblanceolate or obovate, acute and apiculate, 3 to 9 lines long; umbels 4 to 8 (or 10)-flowered; flowers 2½ to 3½ lines long; calyx slightly more than ½ as long as the corolla, the filiform teeth nearly as long as the tube; corolla yellow, aging deep red; pods terete, arcuate, not keeled or only slightly so, abruptly beaked, usually 2-seeded, the body 1½ to 3 lines long, the beak about as long.

Flood beds of streams, alluvial valleys or sandy flats, 5 to 2000 (or 6500) feet: near the coast from Sonoma Co. to San Diego Co.; also in the montane region (west of the deserts) in Southern California. Apr.-Oct.

Locs.—Bodega Pt., Sonoma Co., *Eastwood;* Bolinas Bay, Marin Co., *Chesnut;* San Francisco, *Jepson* 13,803; Felton Big Trees, Santa Cruz, *K. Brandegee;* Carmel, *Ottley* 1256; San Simeon, *T. Brandegee;* Colton, *Dunn;* Strawberry Valley, Mt. San Jacinto, *Jepson* 2288; San Jacinto River (e. of Florida), *Jepson* 1255; Palomar Mt., *T. Brandegee.* The var. heermannii Ottley has a thinner pubescence (the stems often glabrate), smaller flowers (1½ to 2½ lines long) and often 1-seeded pods. These characters are, however, not always associated, so that the variety is more or less indefinite. The following specimens may be cited as var. HEERMANNII, though some are nebulous between the species and variety: Soquel Creek, Santa Cruz Mts., *Jepson* 13,802; Tujunga Cañon, near San Fernando, *Ottley* 692; Arroyo Seco, San Gabriel Mts., *Peirson* 99; Fish Cañon, San Gabriel Mts., *Peirson* 510; Lytle Creek, San Antonio Mts., *Ottley* 712; San Bernardino, *Parish;* Palm Cañon, San Jacinto Mts., *Jepson* 1362a; Devils Cañon, Santa Rosa Mts., *Clary* 17; Indian Cañon, Collins Valley, San Diego Co., *Jepson* 8846; Mesa Grande, San Diego Co., *E. Ferguson* 111.

Refs.—LOTUS ERIOPHORUS Greene, Erythea 1:207 (1893); Jepson, Fl. W. Mid. Cal. 303 (1901), ed. 2, 231 (1911), Man. 553 (1925). *Hosackia tomentosa* H. & A. Bot. Beech. 137 (1832), type from Cal., *Douglas;* not Lotus tomentosus Desr. (1789). *Syrmatium tomentosum* Vogel, Linnaea 10:591 (1836). *L. tomentosus* Greene, Pitt. 2:150 (1890). *Syrmatium eriophorum* Hel. Muhl. 9:67 (1913). Var. HEERMANNII Ottley, Univ. Cal. Publ. Bot. 10:232 (1923); Jepson, Man. 553 (1925). *Hosackia heermannii* D. & H. Jour. Acad. Phila. ser. 2, 3:39 (1854), type loc. Tejon Pass, Los Angeles Co., *Heermann* (less pubescent; flowers smaller). *Syrmatium heermannii* Greene, Bull. Cal. Acad. 2:148 (1886). *L. heermannii* Greene, Pitt. 2:150 (1890); Jepson, Fl. W. Mid. Cal. 303 (1901), ed. 2, 231 (1911).

26. **L. ornithopus** Greene. CATALINA LOTUS. Stems woody below, ascending, much branched above, 1 to 3 feet high; herbage densely silky-pubescent with short appressed hairs; leaves 6 to 12 lines long; leaflets 3 to 7, oblong to rhomboidal, acute at each end, 3 to 8 lines long; peduncles ¼ to 1¾ inches long, usually much exceeding the leaves; umbels 12 to 20-flowered, capitate, globose, 6 to 12 lines wide; bract of 1 leaflet; flowers 4 to 5 lines long; calyx-teeth linear-subulate, densely pilose with spreading hairs; corolla yellow, nearly twice as long as the calyx; pods pubescent, 2-seeded, conspicuously exceeding the calyx, the body about 2½ to 3½ lines long, gradually attenuate into the curved beak.

Sea cliffs or moist flats, 5 to 1000 feet: Santa Barbara Islands. South to Guadalupe Isl. Apr.-May.

Locs.—Avalon, Santa Catalina Isl., *Jepson* 3066; San Nicolas Isl., *Blanche Trask;* Santa Barbara Isl., *Blanche Trask.*

Refs.—LOTUS ORNITHOPUS Greene, Pitt. 2:149 (1890). *Hosackia ornithopus* Greene, Bull. Cal. Acad. 1:185 (1885), type loc. Guadalupe Isl., *Greene. Syrmatium ornithopus* Greene, Bull. Cal. Acad. 2:148 (1886). *L. argophyllus* var. *ornithopus* Ottley, Univ. Cal. Publ. Bot. 10:238 (1923); Jepson, Man. 554 (1925). *Hosackia venusta* Eastw. Proc. Cal. Acad. ser. 3, 1:103 (1898), type loc. San Nicolas Isl., *Trask. L. venustus* Hel. Cat. N. Am. Pl. ed. 2, 7 (1900). *Syrmatium venustum* Dav. & Mox. Fl. S. Cal. 199 (1923), incorrectly ascribed to Eastwood.

27. **L. scoparius** Ottley. Deer Weed. Stems diffuse or erect, often bushy, ½ to 5 feet high, the branches long-virgate, rush-like and greenish; herbage nearly glabrous, the young parts and calyx often silky; leaves 3½ to 6 (or 11) lines long; stipular ridges prominent; leaflets 3 (4 or 5), oblong or oblanceolate (or oval), acute, 2 to 5 lines long; umbels crowded on the upper part of the branches or sometimes scattered, sessile or nearly so, 1 to 5-flowered; flowers 3½ to 5½ lines long; pods much surpassing the calyx, 1 or 2-seeded, the body 1½ to 3 lines long, the beak ½ to as long or longer.

Rocky ridges and clay slopes in the hills, 10 to 2500 feet: Sierra Nevada foothills from Amador Co. to Kern Co.; Coast Ranges from Humboldt Co. to San Luis Obispo Co.; south to coastal Southern California. Far south into Lower California. Feb.-Oct.

Field note.—Lotus scoparius is an abundant species throughout its range, especially in coastal Southern California where it is often one of the dominant elements in the shrubby and bushy cover of the lower unforested hills and mesas. Its economic uses are several. The long reed-like stems are used as thatch for cabins by the native tribesmen dwelling about Warner Pass in San Diego Co. The stems are laid on in bundles and a hut so covered is regarded as rainproof. It is also valued as a browse for cattle, but has a much wider use as a bee plant, since it is the fourth most important native source of nectar for the honey bee in the south coastal counties, the others being Salvia apiana and mellifera and Eriogonum fasciculatum. Its prolonged period of bloom, from June to September, is important in this regard. The leaves are often largely or completely deciduous after flowering in May or June; the pods are matured on the naked stems; and the plant passes the hot period of the dry season as a switch plant. With the early fall rains the stems again become foliated. Thus during the latter part of the rainless season the slender virgate branches dotted with stipular glands present a characteristic aspect, whence the folk name "Wild Broom". "Deer Clover" alludes to browsing by deer, while "Wild Alfalfa" is a name used by stockmen who appreciate its forage value.

Locs.—Sierra Nevada: West Point bridge, Amador Co. (Univ. Cal. Publ. Bot. 10:228); Parrots Ferry, Stanislaus River, *A. L. Grant* 822; Gwin Mine, Calaveras Co., *Jepson;* Friant (rocky hills e. of), Fresno Co., *Jepson;* Springville, Tulare Co., *Purpus;* Caliente, Kern Co., *Heller* 7624. Coast Ranges: South Fork Eel River, s. of Garberville, *Tracy* 5048; Buckeye Creek, Hershey, Yolo Co., *Jepson* 8959; Healdsburg, *Alice King;* Weldon Cañon, Vaca Mts., *Jepson* 13,804; Howell Mt., Napa Range, *Jepson* 13,805; Sonoma Cañon, Kenwood, *Jepson* 10,007; Inverness, Marin Co., *Jepson;* Moraga Ridge, Oakland Hills, *Jepson* 10,392; Salada, San Mateo Co., *Newlon* 249; Carmel, *Ottley* 1262; Santa Lucia Creek, Santa Lucia Mts., *Jepson* 4750; Templeton, San Luis Obispo Co., *Davy* 7639. Intermontane and coastal S. Cal.: Santa Barbara; Ojai Valley, Ventura Co., *Olive Thacher* 19; Santa Monica, *Berg;* Rubio Cañon, San Gabriel Mts., *Peirson* 98; Cajon Cañon, *N. C. Wilson;* San Bernardino, *Parish;* Whitewater, San Gorgonio Pass, *Jepson* 11,627; Newport, Orange Co., *Alice King;* Palomar Mt., *Jepson* 1558; Collins Valley, ne. San Diego Co., *Jepson;* Sentenac Valley, e. San Diego Co., *Jepson;* Witch Creek, San Diego Co., *Alderson;* Coronado, *W. S. Cooper* 308.

Var. **veatchii** Ottley. Decumbent, more pubescent than the species; leaflets oblanceolate, obtuse; umbels 5 to 8-flowered, nearly sessile; flowers 5 to 6 lines long; calyx-teeth subulate-triangular; pods 2-seeded.—San Miguel Isl. Also in Lower California.

Var. **dendroideus** Ottley. Erect, more woody and leafy than the species, 4 to 7 feet high; peduncles short (2½ to 3 lines long); umbels 7 to 12-flowered; flowers 4½ to 6 lines long; pods 2 or 3-seeded, longer than in the species.—Santa Cruz, Santa Rosa and Santa Catalina Isls. Jan.-Aug.

Var. **traskiae** Ottley. Erect; leaflets oblanceolate, obtuse; umbels 3-flowered, pedunculate, with or without a 1-foliolate bract; calyx-teeth short, subulate-triangular; claws conspicuously exserted.—Santa Catalina Isl. (Dav. & Mox. Fl. S. Cal. 199); San Clemente Isl.

Var. **brevialatus** Ottley. Flowers 4 to 5 lines long; banner short, keel extending noticeably beyond the upward-curving wings.—Southern California, in the cismontane and intermontane region: Little Tujunga Wash, San Gabriel Mts., *Ottley* 589; San Bernardino, *Parish;* Martinez Cañon, Santa Rosa Mts., *Clary* 1193; Box Cañon near Mason Valley, e. San Diego Co., *Jepson* 8671.

Refs.—Lotus scoparius Ottley, Univ. Cal. Publ. Bot. 10:227 (1923); Jepson, Man. 554, fig. 545 (1925). *Hosackia scoparia* Nutt.; T. & G. Fl. 1:325 (1838), type loc. Santa Barbara, *Nuttall*. *Syrmatium glabrum* Vogel, Linnaea 10:591 (1836), type from Cal.; not L. glaber Mill. (1768). *Hosackia glabra* Torr. Phanerogamia of Pac. Coast, Wilkes Exped. 274 (1874). *L. glaber* Greene, Pitt. 2:148 (1890); Jepson, Fl. W. Mid. Cal. 304 (1901), ed. 2, 232 (1911). *Anisolotus glaber* Armstrong & Thornber, Field Book Western Wild Fls. 244 (1915). *Hosackia crassifolia* Nutt. l.c., type loc. Santa Barbara, *Nuttall;* not Bentham (1837). *H. scoparia* var.

diffusa Gray, Proc. Acad. Phila. 15:346 (1863). *L. diffusus* Hel. Cat. N. Am. Pl. ed. 2, 7 (1900). Var. VEATCHII Ottley, l.c. 228; Jepson, Man. 555 (1925). *Hosackia veatchii* Greene, Bull. Cal. Acad. 1:83 (1885), type loc. Elide, L. Cal., *Veatch*. *Lotus veatchii* Greene, Pitt. 2:148 (1890). *Syrmatium patens* Greene, Bull. Cal. Acad. 2:147 (1886), type loc. San Miguel Isl., *Greene*. Var. DENDROIDEUS Ottley, l.c.; Jepson, Man. 555 (1925). *Syrmatium dendroideum* Greene, Bull. Cal. Acad. 2:146 (1886), type loc. Santa Cruz Isl., *Greene*. *Lotus dendroideus* Greene, Pitt. 2:148 (1890). Var. TRASKIAE Ottley, l.c.; Jepson, l.c. *Syrmatium traskiae* Eastw.; Abrams, Fl. Los Ang. 201 (1917), type loc. Mosquito Harbor, San Clemente Isl., *Trask* 287. Var. BREVIALATUS Ottley, l.c. 229; Little Tujunga Wash, San Gabriel Mts., *Ottley* 589; Jepson, l.c.

28. **L. benthamii** Greene. SONOMA LOTUS. Stems rush-like, brownish, freely branched, 1½ to 3 feet high, sometimes diffuse and forming plants 3 to 4 feet wide; herbage glabrous; leaves 2 to 7½ lines long; stipules prominent; leaflets 3 to 5, oblong or cuneate-oblanceolate, 1½ to 6 lines long; peduncles 2 to 7 lines long, exceeding the leaves; umbels 5 or 8 to 11-flowered; bract of 1 or 2 leaflets, sometimes lacking; flowers 3 to 4 lines long; calyx-teeth lanceolate, ½ as long as the tube; corolla red, aging whitish; pods somewhat geniculate-falcate, the body 1½ to 4 lines long, the beak half to nearly as long; seeds 2.

Along the coast, 10 to 500 feet: Sonoma Co. to Santa Barbara Co. Apr.-Oct.

Tax. note.—Lotus benthamii is not separable from L. scoparius by really satisfactory characters and it were perhaps better genetically disposed as a variety of that species. It is also very closely related to L. junceus, the only dependable character of separation seeming to be the form of the calyx-teeth. In all other respects L. benthamii and L. junceus seem much alike and their geographic ranges are not distinct. The habit of the two in the field may well receive closer study than has been given.

Locs.—Fort Ross, Sonoma Co., *Heller* 6597; Monterey, *Jepson* 13,816; Pt. Lobos, *S. C. Brooks;* Sierra Creek, near Notley's Ldg., Monterey Co., *Jepson* 2611; Lucia, Santa Lucia Mts., *Jepson* 1667; Gorda, Monterey coast, *K. Brandegee;* San Simeon, *K. Brandegee;* Santa Barbara (T. & G. Fl. 1:324).

Refs.—LOTUS BENTHAMII Greene, Pitt. 2:148 (1890); Jepson, Fl. W. Mid. Cal. 304 (1901), ed. 2, 232 (1911), Man. 555 (1925). *Hosackia cytisoides* Benth. Trans. Linn. Soc. 17:366 (1837), type from Cal., *Douglas;* not Lotus cytisoides L. (1753). *Syrmatium cytisoides* Greene, Bull. Cal. Acad. 2:147 (1886). *Hosackia cytisoides* var. *rubescens* T. & G. Fl. 1:324 (1838), type loc. recorded as "near St. Diego," *Nuttall*, but doubtless Santa Barbara, since not known from the San Diego region today.

29. **L. junceus** Greene. RUSH LOTUS. Stems many from the root-crown, much branched, the branches 1, 2 or 3 at a node, grooved or angular, wiry, forming an erect broom-like tuft ¾ to 2 feet high; herbage bright green, glabrous; leaves 3 to 6 lines long; leaflets 3 to 5, obovate to oblong or linear, 2 to 3½ lines long; umbels 1 to 4-flowered, subsessile in the axils or on peduncles ¼ to 2 lines long; bracts mostly none; flowers 3 to 4 lines long; calyx-teeth triangular-acute, ⅙ to ⅕ as long as the tube; pods short (2 to 3 lines long), fat and terete, arcuate, 1-seeded.

Dry hills and ridges, 500 to 1500 feet: Contra Costa Co. to San Luis Obispo. Apr.-June.

Locs.—Moraga Ridge, Oakland Hills, *Ottley* 777; Gigling sta., n. Monterey Co., *Ferguson* 271; Monterey-Carmel road, *Heller* 6826; San Luis Obispo, *Brewer* 475.

Var. **biolettii** Ottley. Stems more delicate and wiry than in the species, prostrate to decumbent; pubescence more abundant, of short appressed hairs; leaflets oblanceolate to obovate, obtuse or acute; peduncles 2½ to 10 lines long; bract of 1 leaflet.—Dry ridges and burns: along the coast from Mendocino Co. to Marin Co. May-Oct.

Locs.—Fort Bragg, *Ottley* 1513; Pt. Arena, *Davy* 6021; Mt. Tamalpais.

Refs.—LOTUS JUNCEUS Greene, Pitt. 2:148 (1890); Jepson, Man. 555 (1925). *Hosackia juncea* Benth. Trans. Linn. Soc. 17:366 (1837), type from Cal., *Douglas*. *Syrmatium junceum* Greene, Bull. Cal. Acad. 2:147 (1886). Var. BIOLETTII Ottley, Univ. Cal. Publ. Bot. 10:231 (1923); Jepson, l.c. 555. *L. biolettii* Greene, Pitt. 2:222 (1892), type loc. above Mill Valley, Marin Co., *Bioletti;* Jepson, Fl. W. Mid. Cal. 304 (1901), ed. 2, 232 (1911). *Syrmatium biolettii* Hel. Muhl. 9:67 (1913).

30. **L. haydonii** Greene. ROCK LOTUS. Stems numerous, forming a thick erect rush-like tuft 8 to 11 inches high, the leaves and flowers inconspicuous; herbage

green, apparently glabrous but scantily and minutely puberulent; leaves remote, ½ to 3 lines long; leaflets 3, elliptic, ½ to 2 lines long; peduncles ½ to ¾ line long, shorter than the leaves; umbels subsessile, 1 or 2-flowered; flowers 2 lines long; calyx-teeth linear-lanceolate, ½ as long as tube; corolla yellow; pods incurved, 1-seeded.

Rocky slopes, 2500 feet: mountains on west side of Colorado Desert, boundary of San Diego and Imperial counties.

Lotus haydonii is an extremely rare species. Apparently it has been collected only at Mountain Springs on the east slope of the mountains east of Carrizo Gorge. It has a distinctive habit and needs study in the field.

Refs.—LOTUS HAYDONII Greene, Pitt. 2:149 (1890); Jepson, Man. 555 (1925). *Hosackia haydonii* Orcutt, West. Am. Sci. 6:63 (1889), type loc. cañon leading into Colorado Desert, on San Diego to Fort Yuma stage line, *Orcutt*. *Syrmatium haydonii* Hel. Muhl. 9:67 (1913). *L. spencerae* Mcbr. Contrib. Gray Herb. 53:13 (1918), type loc. Mountain Sprs., Colorado Desert, *M. F. Spencer*.

18. AMORPHA L.

Deciduous shrubs with heavy-scented herbage. Leaves odd-pinnate, with caducous stipules and stipels, the leaflets dotted with translucent glands. Flowers small, violet or purple, in long and narrow terminal spikes. Calyx obconic, 5-toothed, persistent. Petals wanting except the banner, this erect, clawed, folded around the stamens and style. Stamens monadelphous at the very base, otherwise distinct, longer than the banner. Pod short, but exceeding the calyx, 1 or 2-seeded, tardily dehiscent.—Species 10 to 15, North America. (Greek amorphos, deformed, alluding to the corolla.)

Branchlets and leaves without prickle-like glands; calyx-teeth very short, low-triangular.............. 1. *A. fruticosa.*

Branchlets and leaf-rachises with prickle-like glands; calyx-teeth acute-triangular or lanceolate, ½ to ¾ as long as the tube...2. *A. californica.*

1. **A. fruticosa** L. MOCK INDIGO. Shrub 3 to 8 feet high; herbage minutely pubescent; leaflets 11 to 15, ovate to oblong, ¾ to 1⅜ inches long, shortly petioluled; stipules and bracts (as also in no. 2) linear-lanceolate, caducous; racemes 3 to 9 inches long; calyx canescent, especially on the teeth, with many glands; banner dark purple, truncatish or notched, 3 lines long; pod 4 lines long, with conspicuous blister-like glands.

Along streams in the foothills and mountains, 100 to 6500 feet: San Bernardino Mts. and south to San Diego Co. South to Lower California, east to Arizona, the Mississippi Valley and Florida. May-July.

Locs.—Santa Ana Cañon, Orange Co., *J. T. Howell* 2449; San Bernardino, *Parish;* Vandeventer Flat, head of Palm Cañon of San Jacinto, *Jepson* 1343; Santa Rosa Indian Village, Santa Rosa Mts., *Jepson* 1446; Ramona, *K. Brandegee;* Santa Ysabel, *Alderson* 1716; Witch Creek, *Alderson* 222; Jamacha, *Chandler* 5279; Jacumba, *Cleveland;* San Diego, *H. P. Kelley.*

Refs.—AMORPHA FRUTICOSA L. Sp. Pl. 713 (1753), type loc. Carolina; Jepson, Man. 556 (1925). *A. occidentalis* Abrams, Bull. N. Y. Bot. Gard. 6:394 (1910), type loc. San Diego River near old San Diego Mission, *Abrams* 3425.

2. **A. californica** Nutt. MOCK LOCUST. Shrub 4 to 9 feet high; herbage minutely pubescent; leaflets 11 to 27, oblong-elliptical, mucronulate at the retuse apex, shortly petioluled, ½ to 1½ inches long; rachis with prickle-like glands, the prickles slender or pustulate-dilated at base, often more or less deciduous late in the season; racemes 2 to 5½ inches long; calyx pubescent; corolla dark purple, 3 lines long; pod 2½ lines long, with many low circular glands which are depressed or somewhat excavated in the center.

Wooded cañons, 500 to 6000 feet: northern Sierra Nevada foothills from Shasta Co. to Placer Co.; Marysville Buttes; Napa Co. to San Luis Obispo Co.; Mt. Pinos; south to the San Gabriel, San Bernardino, San Jacinto and Santa Ana mountains. Lower California. May-July.

The glands.—The glandular prickles of the rachis are slender, or in varying degrees pustulate-dilated downward. When pustulate-dilated they are "sessile." Late in the season the whole prickle or the slender tip of the dilated ones are often more or less deciduous. Towards the southern limits of the range the calyces generally bear many glands, towards the north, especially at the north limits, the calyces are destitute or mainly destitute of glands.

The geographic distribution requires notice. It is unusual for a species occurring on both sides of the San Bernardino Mts. to extend north along the coast to the Napa Range and then recur in the northern Sierra Nevada.

Locs.—Sierra Nevada: Montgomery Creek, Shasta Co., *Wieslander;* Gautier bridge, Bear River, Placer Co. Marysville Buttes: South Butte, *W. I. Follette.* Coast Ranges: Austin Creek, Sonoma Co., *Davy* 6007b; Mark West Sprs., Sonoma Co., *Ynes Mexia* 2390; Calistoga (sw. of, at Rebecca ranch), *Jepson* 13,582; Nuns Cañon, Sonoma Co., *Michener & Bioletti;* Mt. Tamalpais (n. slope), *Jepson* 13,583; Arroyo Grande, *Alice King;* betw. Pine Creek bridge and Cuyama Valley, s. San Luis Obispo Co., *Jepson* 12,156. S. Cal.: Alamo Mt., Ventura Co.; Ojai Valley, Ventura Co., *Olive Thacher;* Elysian Park, Los Angeles, *Braunton* 424; Mt. Wilson, *C. E. Hutchinson;* Cajon Pass, *Peirson* 85; Whiskey Spr., Cushenbury Cañon, *Parish* 10,903; Foxesee Creek, San Bernardino Mts., *J. Grinnell* 39; Tahquitz Valley, San Jacinto Mts.

Var. **napensis** Jepson. Subglabrous; racemes 1 to 1¼ inches long; calyx glabrous or nearly glabrous (puberulent in the species) and glandless, its teeth small.—Napa Range, 1500 to 1700 feet: Howell Mt.

Refs.—AMORPHA CALIFORNICA Nutt.; T. & G. Fl. 1:306 (1838), type loc. Santa Barbara, *Nuttall;* Jepson, Fl. W. Mid. Cal. ed. 2, 232 (1911), Man. 556, fig. 547 (1925). *A. hispidula* Greene, Fl. Fr. 14 (1891), type loc. Monterey Co., *Hickman;* Jepson, Fl. W. Mid. Cal. 293 (1901). Var. NAPENSIS Jepson, Man. 556 (1925), type loc. Moore Creek, Howell Mt., *Jepson* 6835.

19. **PAROSELA** Cav. DALEA

Ours small shrubs or small trees. Herbage glandular-punctate. Leaves unequally pinnate or simple; stipules small, subulate; leaflets small, entire. Flowers in terminal spikes or racemes. Calyx with 5 nearly equal teeth or lobes, persistent. Banner cordate or auriculate, inserted opposite the cleft stamen-tube. Stamens monadelphous. Pod ovate, compressed, usually indehiscent, more or less included in the calyx, 1 to 2-seeded. Seeds reniform.—Species about 100, temperate North America and along the Andes to Chile. (Anagram of Psoralea.)

Bibliog.—Vail, A. N., Notes on Parosela with descriptions of new species (Bull. Torr. Club 24:14–18,—1897). Parish, S. B., The California Paroselas (Bot. Gaz. 55:300–313, figs. 1–5,—1913).

- Shrubs, often very low; calyx-tube with a short turbinate base, the petals and stamens inserted at the summit of the turbinate portion; wing and keel petals with free claws or at least adnate only to very base of stamen-tube.
  - Corolla large, glabrous, exceeding the calyx; flowers in racemes.
    - Leafless shrub or small tree; stems white-pubescent, very spinose; calyx white-pubescent; ovules 4 to 6........1. *P. spinosa.*
    - Leafy shrubs; ovules 2.
      - Leaves pinnate, the terminal leaflet often longer than the lateral; petioles rather long (often as long as rachis and terminal leaflet).
        - Leaflets more or less decurrent on rachis, mostly ovate or oblong........2. *P. arborescens.*
        - Leaflets mostly distinct from rachis, narrowly linear or oblong..3. *P. fremontii.*
      - Leaves simple; stems bright green, somewhat spinose; calyx commonly yellowish and nearly glabrous........4. *P. schottii.*
  - Corolla small, more or less pubescent, little exceeding calyx; leaflets distinct from rachis; petioles very short; flowers in very dense spikes.
    - Leaflets 3 to 7, rather large, the terminal conspicuously longer; spikes capitate........5. *P. emoryi.*
    - Leaflets 7 to 13, minute, subequal; spikes short........6. *P. polyadenia.*
- Herbs, sometimes a little woody at base; petals and stamens inserted at base of calyx-tube, the claws of the wing and keel petals adnate to stamen-tube for about half their length.
  - Flowers in loose spike-like racemes; calyx less than half length of corolla........7. *P. parryi.*
  - Flowers in heads; calyx exceeding corolla........8. *P. mollis.*

1. **P. spinosa** Hel. SMOKE TREE. Very spinose and nearly leafless ash-gray low shrub or small tree, 4 to 25 feet high; branchlets numerous, reduced to slender spines 1 to 1½ (or 3) inches long; leaves few, simple, cuneate- or linear-oblong,

nearly sessile, ¼ to 1 inch long, marked with a few large glands and persisting only a few weeks; spikes ½ to 1 inch long; calyx-tube marked by a row of glands; corolla violet-purple, 4 to 5 lines long; ovules 4 to 6.

Washes and cañon bottoms, 5 to 1500 feet: eastern Mohave Desert; Colorado Desert. Arizona to Sonora and Lower California. Jan.-July.

Field note.—The Smoke Tree is on the average less than 10 feet high, though individuals 1½ to 2 times that height are not rare. One of the largest colonies of it is found near Palm Springs of San Jacinto. Although recognized as one of the most common arborescent species in the Colorado Desert, it is rarely found in flower, and very rarely in fruit. Abby L. Waterman of Waterman Ranch in the Mohave Desert tells us that on account of its spiny branchlets it is also called Corona de Cristo and, by the Mexicans along the Colorado River, Ramoceniza, that is "branches of ashes." Young seedlings exhibit simple oblong leaves ½ to 1⅜ inches long lightly sprinkled with brown glands.

Locs.—Mohave Desert: betw. Klinefelter and Needles, acc. *Dix Van Dyke;* near Cadiz (Jepson Field Book 27:71); Soda Lake (w. of), near Baker sta., *Mary Beal;* Silver Cliff Mine, acc. *Dix Van Dyke;* Kane Springs wash, near Ord Mt., *Jepson* 15,539; Little Chemehuevis Valley, Colorado River, *Jepson* 5212; Twentynine Palms, *Jepson.* Colorado Desert: McCoy Wash (Jepson Field Book 26:107); Chuckwalla Bench, *Schellenger* 2; Pinto Basin, *Jepson;* Shaver Cañon, *Jepson;* Red Cañon near Mecca, *Parish* 8167; Coachella Valley, *Clary* 13; Whitewater, *R. J. Smith;* Wagon Wash, near Sentenac Cañon, e. San Diego Co., *Jepson;* Coyote Wells, w. Colorado Desert, *A. W. Lohn.*

Refs.—PAROSELA SPINOSA Hel. Cat. N. Am. Pl., ed. 2, 7 (1900); Jepson, Man. 557, fig. 548 (1925). *Dalea spinosa* Gray, Mem. Am. Acad. n. ser. 5:315 (1855), type loc. "arroyos on the Gila; and on the California desert west of the Colorado", *Thurber, Fremont. Asagraea spinosa* Baill. Adansonia 9:233 (1870). *Psorodendron spinosum* Rydb. N. Am. Fl. 24:45 (1919).

2. **P. arborescens** Hel. MOHAVE DALEA. Rather spiny shrub with somewhat slender branches, 2 to 3 feet high; herbage white-tomentose (eventually quite glabrous), the upper portion of the branches with scattered short bristle-like yellow glands; leaves ¾ to 1¼ inches long, pinnately divided into 5 (3 or 7) obovate mostly subequal leaflets 3 to 4 (or 6) lines long; racemes 1½ to 2 inches long; calyx 3 lines long, its lower teeth recurving, oblong-lanceolate or lanceolate-subulate, nearly as long as tube; fruiting calyx 5 lines long; corolla blue, 4 to 5 lines long; banner obovate, rounded or scarcely emarginate; ovary and lower part of style densely white-hairy with ascending hairs; ovules 2, superposed.

Desert washes and valleys, 2000 to 2500 feet: east central Mohave Desert; Mono Co. Apr.-May. A rare species.

Locs.—Helendale (hills se.), *Mary Beal;* Barstow, *Jepson* 5513, 5831; Blacks Ranch, *Hall & Chandler* 6851; Benton, Mono Co., *Heller* 425.

Refs.—PAROSELA ARBORESCENS Hel. Cat. N. Am. Pl., ed. 2, 5 (1900); Jepson, Man. 557 (1925). *Dalea arborescens* Torr.; Gray, Mem. Am. Acad. n. ser. 5:316 (1855), type loc. stated as "mountains of San Fernando, California", *Fremont,* but an error, since it is a Mohave Desert species undoubtedly collected at or near Barstow; Parish, Zoe 4:341 (1894). *Psorodendron arborescens* Rydb. N. Am. Fl. 24:42 (1919). *Parosela neglecta* Parish, Bot. Gaz. 55:306 (1913), type loc. Fishpond sta. (Daggett), *Parish* 644.

3. **P. fremontii** Vail. FREMONT DALEA. Shrub 1 to 3 feet high; nearly glabrous or the leaves thinly canescent; leaves pinnate; leaflets 3 to 5, narrowly oblong, 3 lines long, mostly distinct from rachis; racemes loose, 3 to 5 inches long; calyx 3 lines long, finely pubescent outside and inside, its lower teeth subulate, as long as tube; corolla purple, 5 lines long; banner orbicular, notched at apex; lower portion of style and margins of ovary white-hairy with close ascending hairs; ovules 2, sub-collateral.

Dry mountain slopes and valleys, 2000 to 3000 feet: Owens Valley. East to Nevada and Utah. Apr.-June.

The original form of Parosela fremontii occurs in southern Utah and Nevada, and recurs sparingly in the Owens Valley in California (Owens Lake, Inyo Co., *Jepson* 5125a; Benton, Mono Co., *Shockley* 425). Otherwise the species is represented in California by a series of plants highly variable in outline of leaflets, in pubescence and in glandular character. Because of certain marked extremes these plants are here segregated in varietal categories, but these categories are necessarily only approximations, since there are many intergrades and many diverse forms.

Var. **saundersii** Mcbr. Herbage more or less canescent, sometimes becoming quite bright green; leaflets mostly rather short and broad (elliptic to oblong or oblong-ovate, 3 to 7 lines long); calyx brownish, nearly or quite glabrous outside, hairy inside.—Desert slopes and mesas, 2000 to 6000 feet: eastern Mohave Desert; north to Mono Co.

Locs.—Victorville, *Hall* 6197; Barstow, *Jepson* 4785, 5355; Coolgardie Yucca mesa, n. of Daggett, *Jepson* 6697; Randsburg, *K. Brandegee;* Emigrant Cañon, Panamint Range, *Jepson* 7119; Big Pine, *Hall & Chandler* 7222; Bishop, *K. Brandegee.*

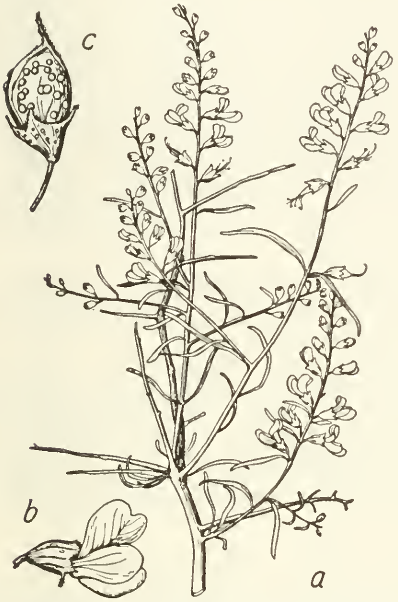

Fig. 203. Parosela schottii Hel. *a*, fl. branch, × ½; *b*, fl., × 1½; *c*, pod, × 1½.

Var. **johnsonii** Jepson. Herbage mostly persistently canescent; leaflets mostly long and narrow (narrowly linear or linear-lanceolate, 3 to 10 lines long, the terminal commonly longer than the lateral); calyx canescent or weakly puberulent outside, hairy inside or with a tuft of hairs at the sinuses.—Desert slopes and mesas: Death Valley ranges; Cottonwood Mts. and Ord Mt. East through southern Nevada to northern Arizona and southwestern Utah.

Locs.—Funeral Mts., *Jepson* 6908; Hanaupah Cañon, Panamint Range, *Jepson* 7103 (a narrow zone, about 1 mile wide); Ord Mt., *Jepson* 5852; White Tank, w. side of Pinto Mts., n. Riverside Co., *Jepson* 12,625; Lookout Mt., n. of Indio, *Jepson* 5982; Cottonwood Mts., *Hall* 6024. The two latter collections clearly intergrade to the next variety.

Var. **californica** Jepson comb. n. Leaflets sometimes more or less decurrent on rachis; calyx canescent.—Valleys and cañons, 1000 to 3500 feet: desert slopes of the San Jacinto Mts. and east end of San Bernardino Mts.; also in San Jacinto Valley (cismontane S. Cal.). This form is scarcely worth a separate category.

Locs.—Byrnes Cañon, e. end San Bernardino Mts., *Parish* 2991; Warren's Well, *Parish* 2992; Morongo Wash, *Munz* 5167; Palm Sprs. of San Jacinto, *Parish* 4111; Banning, *Gilman;* Palm Cañon of San Jacinto, *Jepson* 1348; San Jacinto Valley, *Geo. F. Reinhardt.*

Refs.—Parosela fremontii Vail, Bull. Torr. Club 24:16 (1897); Jepson, Man. 558 (1925). *Dalea fremontii* Torr.; Gray, Mem. Am. Acad. n. ser. 5:316 (1855), type loc. "mountains of Pah-Ute country" (that is, Muddy River, s. Nev.), *Fremont* 417. *Psorodendron fremontii* Rydb. N. Am. Fl. 24:43 (1919). *Parosela wheeleri* Vail, Bull. Torr. Club 24:17 (1897), type from Nevada, Wheeler Exp. *P. fremontii* var. *wheeleri* Rob.; Mcbr. Contrib. Gray Herb. 65:16 (1922). *Psorodendron wheeleri* Rydb. N. Am. Fl. 24:42 (1919). Var. saundersii Mcbr. Contrib. Gray Herb. 65:16 (1922); Jepson, Man. 558 (1925). *Dalea saundersii* Parish, Bull. S. Cal. Acad. 2:83, pl. 2 (1903), type loc. Victorville, *Saunders. Parosela saundersii* Abrams, Bull. N. Y. Bot. Gard. 6:396 (1910). *P. johnsonii* var. *saundersii* Parish, Bot. Gaz. 55:308 (1913). *Psorodendron saundersii* Rydb. N. Am. Fl. 24:44 (1919). Var. johnsonii Jepson, Man. 558 (1925). *Dalea johnsonii* Wats. Bot. King 64 (1871), type loc. near St. George, Virgin River, Utah., *J. E. Johnson, Palmer. Parosela johnsonii* Vail, Bull. Torr. Club 24:16 (1897). *Psorodendron johnsonii* Rydb. N. Am. Fl. 24:43 (1919). *Parosela johnsonii* var. *minutifolia* Parish, Bot. Gaz. l.c., type loc. mouth of Panamint Cañon, *Hall & Chandler* 7002. Var. californica Jepson. *Dalea californica* Wats. Proc. Am. Acad. 11:132 (1876), type loc. San Bernardino Mts., *Parry. Parosela californica* Vail, Bull. Torr. Club 24:17 (1897); Jepson, Man. 558 (1925). *Psorodendron californicum* Rydb. N. Am. Fl. 24:43 (1919). *Parosela californica* var. *simplifolia* Parish, Bot. Gaz. 55:309 (1913), type loc. betw. Palm Springs and Whitewater, western part of the Colorado Desert, *M. F. Gilman* 51; 1 to 4 leaves next the inflorescence are sometimes simple in the var. californica; in the var. simplifolia these simple leaves are a little longer and more conspicuous than usual.

4. **P. schottii** Hel. Mesa Dalea. (Fig. 203.) Shrubby slender somewhat spinose bush 3 to 8 feet high; herbage bright green and nearly glabrous, or the young parts canescent; glandular dots dark, but the branches nearly glandless;

leaves simple, linear, ½ to 1¼ inches long; flowers blue in loose racemes 1 to 4 inches long; calyx yellowish, subglabrate or puberulent, 2½ to 3 lines long, obscurely glandular, its teeth low-triangular or shortly acute, ciliate-margined; corolla 4 to 5 lines long; banner obcordate; wings broadly oblong; keel-petals semi-orbicular with a strongly auricular lobe at base; ovary and style pubescent; ovules 2, collateral; pods obliquely elliptic, 4 to 6 lines long, conspicuously marked with red glands, containing a single large seed.

Dry gravelly mesas, 100 to 500 feet: Colorado Desert. South to Lower California. Apr.

Locs.—Ft. Yuma, *Lemmon;* Chuckwalla Mt.; Shaver Cañon, *Jepson;* Painted Cañon, n. of Mecca, *Jepson* 11,683; Coral Reef Cañon, Santa Rosa Mts., *Clary* 12; Thousand Palms Cañon near Indio, *Jepson* 6040; Palm Springs of San Jacinto, *Schellenberg;* Silent Cañon, se. end Santa Rosa Mts., *Jepson* 11,704; Borrego Valley, w. side, *Jepson* 8819; Yaqui Well, e. San Diego Co., *Jepson* 12,521; Wagon Wash near Sentenac Cañon, *Jepson* 8950, 12,465; Vallecito, e. San Diego Co., *Jepson* 8557. The four last-cited collections represent something of intergrades to the var. puberula Parish.

Var. **puberula** Parish. Herbage densely white-pubescent, only tardily subglabrate; calyx canescent.—West side of Colorado Desert: Meyers Creek bridge, sw. Imperial Co., *Jepson* 11,770.

Refs.—PAROSELA SCHOTTII Hel. Cat. N. Am. Pl., ed. 2, 6 (1900); Jepson, Man. 557 (1925). *Dalea schottii* Torr. Bot. Mex. Bound. 53 (1859), type loc. "banks of the Colorado," *Schott. Psorodendron schottii* Rydb. N. Am. Fl. 24:44 (1919). Var. PUBERULA Parish, Bot. Gaz. 55:312 (1913), type loc. w. Colorado Desert, *T. Brandegee. Psorodendron puberulum* Rydb. N. Am. Fl. 24:45 (1919).

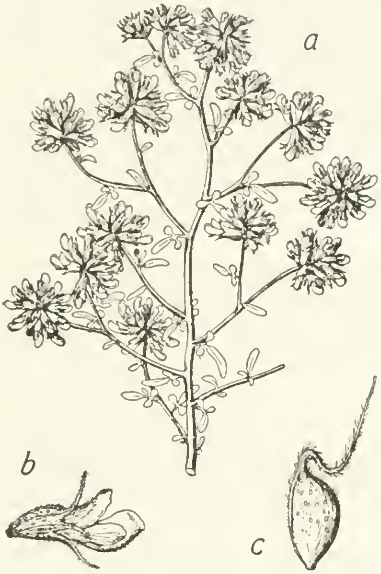

Fig. 204. PAROSELA EMORYI Hel. *a*, fl. branch, × ½; *b*, fl., × 2; *c*, pistil, × 5.

5. **P. emoryi** Hel. WHITE DALEA. (Fig. 204.) Densely and divaricately branched shrub 1 to 4 feet high, white with a close felt-like tomentum, commonly sprinkled with red glands; leaves ¾ to 1½ inches long, pinnate with 5 to 7 leaflets, sometimes 3 or reduced to 1; leaflets obovate, 2 to 6 lines long, or the terminal leaflet linear or oblong, commonly much longer than the lateral, that is, 6 to 11 lines long; spikes very dense, capitate to oblong, ¼ to ¾ inches long; calyx 2½ to 3 lines long, 10-ribbed, rusty-pubescent, with subulate teeth as long as tube; corolla purple, 3 lines long; banner orbicular, cordate at base, the midrib very hairy on back; keel hairy on under side; style (except tip) and ovary (except base) densely short-hairy when young; ovules 2, collateral.

Desert valleys, 175 to 500 feet: Colorado Desert. Arizona to Sonora and Lower California. Apr.-May.

Field note.—Wings and banner each with a slight notch at apex, a glandular mucro in the notch. Wings pubescent on lower side. The flowers instantly stain purple the hands or field-press paper.

Locs.—Algodones Sand Hills near Grays Well, *Jepson* 11,723; Signal Mt., *Abrams* 6323; Carrizo Creek, *T. Brandegee;* San Felipe wash, w. Colorado Desert, *Jepson* 8899; Borrego Spr., *Jepson* 8891; Silent Cañon, Santa Rosa Mts. (se. end), *Jepson* 11,697; Palm Sprs. of San Jacinto, *Jepson* 6060; Indio, *Jones;* Painted Cañon, Mecca, *Jepson* 11,690a; McCoy Wash, McCoy Mts., *Hall.*

Refs.—PAROSELA EMORYI Hel. Cat. N. Am. Pl. ed. 2, 6 (1900); Jepson, Man. 558 (1925). *Dalea emoryi* Gray, Mem. Am. Acad. n. ser. 5:315 (1854), type loc. "desert tablelands, Gila River, Ariz.," *Emory. Psorothamnus emoryi* Rydb. N. Am. Fl. 24:47 (1919).

6. **P. polyadenia** Hel. NEVADA DALEA. Stout somewhat spinose very divaricately branched shrub 1 to 2 (or 5) feet high; stems and leaves densely canescent, thickly sprinkled with yellowish saucer-shaped glands; leaves pinnate, 3 to 8 lines long, the petioles short or almost none; leaflets 7 to 9 (or 13), obovate, notched at apex, 1 line long; racemes dense, 4 to 7 lines long; calyx 2 lines long, hairy (especially on the teeth) and with prominent red glands between the strong callus-ribs of the tube, the teeth lanceolate or subulate, almost equaling or longer than the tube; corolla pinkish or violet, 3 lines long; banner roundish to oblong-elliptic; ovary glabrous except the hairy summit; ovules 2, collateral; style hairy with spreading hairs; seed 1.

Desert mesas and sandy plains, 2000 to 6000 feet: central Mohave Desert; Owens Valley. North to Nevada. May-June.

Locs.—Barstow, *Jepson* 6151; Daggett (range s. of), *Mary Beal;* Lone Pine, *Jepson* 5140. Nev.: Candelaria, *Shockley* 275.

Var. subnuda Parish. Calyx-tube nearly or quite glabrous.—Inyo and Mono Cos.

Locs.—Owens Valley, *S. W. Austin* 171; Laws, near Bishop, *K. Brandegee;* Mono Co., *J. H. Harcourt.*

Refs.—PAROSELA POLYADENIA Hel. Cat. N. Am. Pl. ed. 2, 6 (1900); Jepson, Man. 558, fig. 549 (1925). *Dalea polyadenia* Torr.; Wats. Bot. King 64, pl. 9 (1871), type loc. "borders of Truckee desert, Nev.," *W. W. Bailey. Psorothamnus polyadenia* Rydb. N. Am. Fl. 24:46 (1919). Var. SUBNUDA Parish, Bot. Gaz. 55:305 (1913); Jepson, Man. 559 (1925). *Dalea polyadenia* var. *subnuda* Wats. Bot. Cal. 2:441 (1880), type loc. Owens Valley, *Matthews. Psorothamnus subnudus* Rydb. l.c.

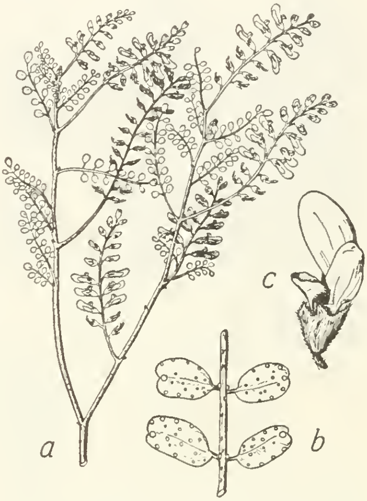

Fig. 205. PAROSELA PARRYI Hel. *a*, fl. branch, × ½; *b*, segment of leaf, × 2½; *c*, fl., × 3.

7. **P. parryi** Hel. PARRY DALEA. (Fig. 205.) Stems slender, diffusely spreading, 1 to 2 feet long; herbage puberulent or glabrate; leaflets 6 to 10 pairs, obovate or oblong, emarginate or obtuse, ½ to 2½ lines long, with distinct petiolules; flowers 3 to 4 lines long, purple, in loose spikes; calyx turbinate, strongly ribbed, somewhat silky-canescent, its teeth ovate, acute, equaling or shorter than tube; banner ⅓ and wings ⅔ as long as keel; banner cordately reniform and with a short sharp point at apex, the larger center whitish and with translucent gland-dots, the purple sides turned in so as almost to make a sac; wings and keel purple lengthwise on upper half, white on lower half; ovules 2; "pod smooth."

Arid gravel benches, washes and rocky slopes, 300 to 2000 feet: easterly part of the mountain region lying between the Mohave Desert and the Colorado Desert. Arizona to Lower California. Dec.-June.

Color note.—The flower is curiously color marked. The banner, so very small, is white with inturned purple edges. The lower half of the keel and wings lengthwise are white, the upper half purple. The effect, therefore, is as if the corolla were marked lengthwise of the middle by a band of indigo, the band carrying white either side of it.

Locs.—Mammoth Tank, *Parish* 1980; betw. Danby and Fenner, *Munz* 4164; Needles, *Jepson* 5486; Black Pt., Riverside Mts., *Jepson* 5248; Virginia Dale; Palo Verde; Palens Mts., *Schellenger;* Chuckwalla bench, *Schellenger* 95; Cañon Springs wash, *Schellenger;* Devils Cañon, Santa Rosa Mts., *Clary;* Wagon Wash near Sentenac Cañon, San Diego Co., *Jepson* 12,470.

Refs.—PAROSELA PARRYI Hel. Cat. N. Am. Pl. ed. 2, 6 (1900); Jepson, Man. 559 (1925). *Dalea divaricata* var. *cinerea* Gray, Proc. Am. Acad. 7:335 (1868), type loc. Ft. Mohave, Ariz., *Cooper. D. parryi* T. & G.; Gray, Proc. Am. Acad. 7:397 (1868). *Parosela divaricata* var. *cinerea* Jtn. Proc. Calif. Acad. ser. 4, 12:1046 (1924).

8. **P. mollis** Hel. DOMINO DALEA. (Fig. 206.) Stems many from the base, 6 to 10 inches long; herbage hairy-pubescent, dotted with black saucer-shaped glands, the leaves under a lens sometimes suggesting domino pieces; leaves ¾ to 1 inch long, with 4 to 6 pairs of leaflets; leaflets obcordate to obovate or oblong, 1½ to 3 lines long; spikes very dense, ¾ to 1½ inches long; calyx concealed by the dense clothing of hairs, 3 to 4 lines long; corolla pinkish, shorter than or little exceeding the subulate plumose calyx-teeth; banner reniform, hardly half length of the keel; keel very broad and blunt at tip; wings shorter than keel, notched at apex.

Desert flats and valleys, –50 to 2500 feet: Colorado and Mohave deserts; eastern Inyo Co. East to Nevada. Apr.-May.

Locs.—Calexico, *Davy* 8005; Dixieland, *Parish* 8311; San Felipe Narrows, *Jepson* 12,534; Salton, *Davy* 8049; Borrego Sprs., *T. Brandegee;* Indio, *Hall* 5792; Painted Cañon, n. of Mecca, *Jepson* 11,637; Corn Sprs., Chuckwalla Mts., *Munz* 4870; McCoy Wash, McCoy Mts., *Hall* 5932; Palo Verde, *Hall* 5956; Needles, *Jones* 3861; Stoddards Well, *Parish* 19,240; Sheephole Mts.; Daggett, *Jepson* 5847; Lavic, *Jepson* 15,479; Andrews Camp, w. Inyo Co., *K. Brandegee;* Surprise Cañon, Panamint Range, *Jepson* 7134; Funeral Mts., *Jepson* 6899; Inyo Mts., e. side, *S. W. Austin* 441.

Refs.—PAROSELA MOLLIS Hel. Cat. N. Am. Pl. ed. 2, 6 (1900); Jepson, Man. 559 (1925). *Dalea mollis* Benth. Pl. Hartw. 306 (1848), type loc. stated as "Monterey, *Coulter*," but an error, since it is a desert species collected without doubt in the Colorado Desert. *Parosela pilosa* Rydb. N. Am. Fl. 24:64 (1919), type loc. Los Angeles Bay, L. Cal., *Palmer* 550.

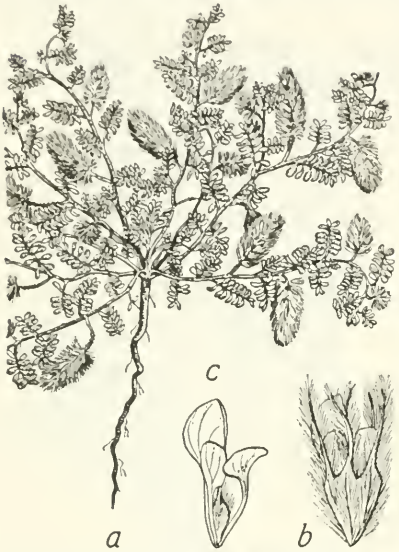

Fig. 206. PAROSELA MOLLIS Hel. *a*, habit, × ¼; *b*, fl., × 3; *c*, fl. with calyx removed, × 3.

20. PSORALEA L.

Ours perennial herbs. Herbage heavy-scented, punctate with dark dots. Leaves 3 or 5-foliolate; stipules free from the petiole. Flowers purple or whitish in spikes or racemes. Calyx 5-cleft. Keel broad, obtuse, joined to the wings. Stamens monadelphous or diadelphous; anthers uniform. Pod seldom exceeding the calyx, 1-seeded, indehiscent.—Species about 130, mostly sub-tropical, all continents. (Greek psoraleos, scurfy or rough, the glands wart-like in some species.)

Our species represent an interesting and suggestive group concerning which much is yet to be learned regarding the habits and life-history and details of range. They differ much as to glands, both as to structure and development. The calyx is non-glandular in Psoralea castorea, californica, douglasii and rigida, and ostensibly not glandular in P. macrostachya; in the other species markedly glandular. The banner of the corolla is orbicular in P. strobilina and P. macrostachya, oblong in the remaining species.

A. Plants from rootstocks; leaves pinnate with 3 leaflets; pod indehiscent, the beak short or none.

Stems prostrate; leaves and peduncles erect; flowers spicate; stamens diadelphous........................ 1. *P. orbicularis.*

Stems erect.
  Stamens monadelphous.
    Peduncles shorter than the leaves.
      Calyx-teeth very unequal, the lower one conspicuously exceeding the corolla; corolla purple; tenth stamen adnate about ⅓ length of column; bracts suborbicular, abruptly lanceolate-tipped, membranous, caducous........................ 2. *P. strobilina.*
      Calyx-teeth short, subequal, or the lower a little longer; corolla white or whitish, about twice as long as the calyx; bracts persistent.

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Calyx inflated in age; tenth stamen adnate about ⅔ length of column; bracts broadly ovate, acute, glandular-dotted, little longer than the pedicels. 3. *P. physodes.*

Calyx not inflated; tenth stamen adnate about ½ length of column; bracts ovate-lanceolate, black-pubescent, ¼ to ½ as long as the flowers........ 4. *P. rigida.*

Peduncles longer than the leaves; calyx black-villous, its lower tooth nearly as long as the corolla; bracts broadly ovate, abruptly acute, caducous........5. *P. douglasii.*

Stamens diadelphous, the tenth stamen free or nearly so.

Leaves glabrous or nearly so; calyx nearly glabrous, conspicuously dotted with saucer-shaped sessile glands; bracts broadly ovate, long-acuminate, undulate-margined, about ⅔ as long as the flowers, persistent..............................6. *P. hallii.*

Leaves pubescent or puberulent; calyx silky, ostensibly non-glandular; bracts roundish-ovate, acuminate, less than half as long as the flowers, deciduous...................... 7. *P. macrostachya.*

B. Plants from tuberous roots; leaves palmate with 5 or 6 leaflets; pod circumscissile or bursting irregularly, the beak long.

Pedicels slender, 2 lines long; calyx-lobes nearly regular..8. *P. californica.*

Pedicels less than 1 line long or none; calyx-lobes markedly irregular, the lower one elliptic, large...9. *P. castorea.*

1. **P. orbicularis** Lindl. Stems creeping and rooting, the long-petioled leaves and peduncles erect; peduncles 10 to 24 inches long; herbage finely pubescent, the inflorescence densely whitish-villous; leaflets 2½ to 4 inches long, the lateral pair broadly obovate, the terminal one more nearly orbicular; petioles 6 to 21 inches long; spikes 3 to 10 inches long; bracts lanceolate, caducous, its glands sessile; flowers 6 to 8 lines long; calyx with stipitate glands scattered among the hairs, cleft almost to the base, the lowest tooth as long as the corolla; petals livid red, whitish towards base; banner often with a white spot on each side of the midvein; pods ovate, acute, 3 lines long.

Grassy vales, meadows or creek bottoms, 500 to 4000 feet: coastal Southern California; Coast Ranges from San Luis Obispo Co. to Sonoma and Napa Cos.; Sierra Nevada from Mariposa Co. to Shasta Co. Lower California. May-July.

Locs.—S. Cal.: Arroyo Seco, San Gabriel Mts. (McClatchie, Fl. Pasadena, 639); Arrastre Creek, San Gabriel Mts., *Peirson* 2474; San Bernardino, *Parish;* Santa Ana, *Alice King;* Palomar Mt., *T. Brandegee;* Witch Creek, San Diego Co., *Alderson.* Coast Ranges: Morro, San Luis Obispo Co., *Barber;* Santa Lucia Creek, Santa Lucia Mts., *Jepson* 4752; Pacific Grove, *Heller* 6793; Mt. Diablo, *McLean;* Lake Temescal, Oakland, comm. *Susie Mott;* Claremont Cañon, Berkeley, *Jepson* 7679; Bolinas Bay, *Kellogg;* Ross Valley, Marin Co., *Jepson* 13,591; Howell Mt., *Jepson* 13,589; Pt. Arena, Sonoma Co., *Bioletti.* Sierra Nevada: Bowers Cave, Mariposa Co., *Jepson* 13,590; Confidence, Tuolumne Co., *Jepson* 7700; Pine Grove, Amador Co., *Hansen* 4; Plumas Co. (Bot. Cal. 1:139); Morleys sta., Shasta Co., *M. S. Baker.*

Refs.—PSORALEA ORBICULARIS Lindl. Bot. Reg. t. 1971 (1837), type cult. from seed sent from California by Douglas; Jepson, Fl. W. Mid. Cal. 294 (1901), ed. 2, 233 (1911), Man. 559 (1925). *Lotodes orbiculare* Ktze. Rev. Gen. Pl. 1:194 (1891). *Hoita orbicularis* Rydb. N. Am. Fl. 24:11 (1919).

2. **P. strobilina** H. & A. Stems erect, 2 to 3 feet high; herbage villous or pubescent throughout, the upper surface of the leaves subglabrous; stems, peduncles and petioles rather densely sprinkled with tack-shaped glands; inflorescence villous; leaflets orbicular to rhombic-ovate, 1¾ to 2¾ inches long; stipules membranous, narrowly ovate, acuminate, about 5 lines long; peduncles shorter than the leaves; spikes short-oblong, 1 to 2 inches long; bracts 7 to 9 lines long, conspicuous; calyx 6 to 9 lines long, the lower tooth much the longest and equaling the purple corolla; ovary white-pubescent, the lower part glabrous.

Hill country or brushy slopes, 100 to 2000 feet: Oakland Hills to the Santa Cruz Mts. May-June.

Psoralea strobilina, the most narrow endemic of any of our species in this genus, save for P. hallii as at present known, is, on the whole, infrequently collected. It does not appear to have been found in the Oakland Hills since early days. Behr (Fl. Vic. S. F. 262) cites "Contra Costa range", an old-time term which meant or at least included the Oakland Hills.

Locs.—Oakland Hills, *Torrey* in 1865; Saratoga, w. Santa Clara Co., *Jepson* 5634; Los Gatos, *R. J. Smith;* Loma Prieta, *Elmer* 4381, 4976; Santa Cruz, *Bolander;* Greninger Cañon, w. of Gilroy, *Jepson* 9701.

Refs.—PSORALEA STROBILINA H. & A. Bot. Beech. 332, pl. 80 (1838), type from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. 295 (1901), ed. 2, 233 (1911), Man. 560 (1925). *Lotodes strobilinum* Ktze. Rev. Gen. Pl. 1:194 (1891). *Hoita strobilina* Rydb. N. Am. Fl. 24:11 (1919).

3. **P. physodes** Dougl. CALIFORNIA TEA. Stems erect, 10 to 23 inches high; herbage nearly glabrous; leaflets ovate, varying to orbicular, mostly acute, 1 to 1¾ inches long; peduncles mostly shorter than the leaves; racemes dense, ½ to 1 inch long, about as broad, the bracts small; calyx cup-shaped, covered with glands which suggest low volcanic craters, and slightly villous with usually dark hairs, about ½ as long as the corolla, at length much enlarged and inflated; calyx-teeth very short and subequal; corolla 5 to 6 lines long; petals greenish-white, the keel purple-tipped; pods suborbicular, compressed, 3 lines long; ovary black-pubescent.

Common in open spots on bushy or wooded slopes of the higher hills or mountains, 300 to 5500 (or 8000) feet: San Bernardino, San Gabriel and Santa Monica mountains to Mt. Diablo, Marin Co. and Humboldt Co. North to British Columbia. Apr.-June.

Econ. note.—The herbage was dried by the pioneers and employed as a substitute for tea. So used it makes a pleasant drink and was called "California Tea." On account of its tough roots it is also called Devil's Shoestring.

Locs.—San Bernardino Mts., *Hall;* Henniger Flats, San Gabriel Mts., *Peirson* 93; Garvanza, Los Angeles, *E. D. Palmer;* Carmel Valley, *Brewer* 673; Los Gatos, *Heller* 7417; Mt. Hamilton, *Davy;* Crystal Springs Lake, San Mateo Co., *Elmer* 4270; Mt. Diablo, *Jepson* 13,595; Las Trampas Hills, *Jepson;* Mt. Tamalpais, *Jepson* 13,596; Sebastopol, *Maud Wheeler;* Howell Mt., *Jepson* 5306; Mt. St. Helena, *Jepson* 10,371; Buck Mt., Humboldt Co., *Tracy* 3949.

Refs.—PSORALEA PHYSODES Dougl.; Hook. Fl. Bor. Am. 1:136 (1838), type loc. "Great Falls of the Columbia to the Rocky Mountains", *Douglas* (but see Contrib. U. S. Nat. Herb. 11:364); Jepson, Fl. W. Mid. Cal. 295 (1901), ed. 2, 234 (1911), Man. 560, fig. 550 (1925). *Lotodes physodes* Ktze. Rev. Gen. Pl. 1:194 (1891). *Hoita physodes* Rydb. N. Am. Fl. 24:8 (1919).

4. **P. rigida** Parish. Similar to P. douglasii; stems erect, 2 to 2½ feet high; herbage and inflorescence with a minute scattered pubescence; leaflets mostly ovate-lanceolate, 1¼ to 3 inches long; racemes 1 to 1¾ inches long; calyx at first black-pubescent, less conspicuously glandular than in P. physodes; calyx-teeth 1 to 2 lines long; corolla white or yellowish-white, the keel with a purple spot.

Dry ridges or mountain slopes, 4000 to 5000 feet: San Bernardino and Santa Rosa mountains to the Cuyamaca Mts. June.

Locs.—Big Bear Lake, San Bernardino Mts., acc. *Peirson;* Burnt Valley, Santa Rosa Mts., *Clary* 993; Oak Grove, *Munz* 9855; Julian, *T. Brandegee;* Stonewall Mine, *Parish* 4415; Cuyamaca Lake, *Harwood* 7179.

Refs.—PSORALEA RIGIDA Parish, Bull. Torr. Club 19:91 (1892), type loc. Oak Grove, San Diego Co., *Parish* 643; Jepson, Man. 561 (1925). *Hoita rigida* Rydb. N. Am. Fl. 24:9 (1919).

5. **P. douglasii** Greene. Stems slender, 4 to 8 feet high; herbage subglabrous, the petioles and sometimes the stems with elevated dot-like glands; leaflets rhombic-ovate, 1¼ to 2½ inches long; spikes somewhat narrow (7 to 8 lines wide), 2 to 3 inches long, on slender peduncles 3 to 5½ inches long; bracts deltoid (or ovate) and long-acuminate, caducous; rachis black-villous; calyx non-glandular, black-villous with a whitish pubescence beneath, especially at base, its teeth often blackish, just shorter than the corolla; corolla 5 lines long, the tips of wings and middle of banner violet or purple, the sides of the reflexed banner whitish; tenth stamen connivent to stamen-column for 1 line, or sometimes quite distinct (even on same plant); ovary silky, but the lower part glabrous.

Grassy valleys or cañon bottoms near the coast, 100 to 2000 feet: Sonoma Co. to the Santa Cruz Mts. and south to San Luis Obispo Co. June-July.

Locs.—Healdsburg, *Alice King;* Fairfax, Marin Co., *Helen Bergfried* 121; Saratoga, Santa Clara Co., *Davy* 303; Loma Prieta, *Elmer* 4405; San Luis Obispo, *Palmer* 69.

Var. **hansenii** Jepson var. n. Calyx-lobes with stipitate glands.—(Calycis lobae glandulis stipitatis.)—Sierra Nevada foothills: Amador Co. (West Point bridge, 2300 feet., *Hansen* 1500, type). Also, apparently, in Tulare Co. and Plumas Co.

Refs.—PSORALEA DOUGLASII Greene, Erythea 3:99 (1895); Jepson, Fl. W. Mid. Cal. 295 (1901), ed. 2, 233 (1911), Man. 560 (1925). *P. macrostachya* Lindl. Bot. Reg. t. 1769 (1835), type from Cal., *Douglas;* not P. macrostachya DC. (1825). *Hoita douglasii* Rydb. N. Am. Fl. 24:11 (1919). Var. HANSENII Jepson.

6. **P. hallii** Jepson comb. n. Stems 2 to 3 feet high, these and the petioles minutely and sparingly puberulent; leaflets rhombic-lanceolate, mucronate, glabrous (but conspicuously glandular), 1½ to 3 inches long; peduncles ½ to 3½ inches long, shorter than the leaves; racemes very dense, 1 to 1½ inches long; bracts abruptly acuminate or lanceolate-tipped, thickish, persistent, keeled, somewhat fluted and undulate-margined, conspicuously dotted with large oil-glands, sparsely puberulent, about ⅔ as long as the flowers; calyx nearly glabrous, conspicuously dotted with large oil-glands, 6½ to 7½ lines long, its tube prominently 10-ribbed, the lower tooth exceeding the others and the corolla; corolla yellowish, the keel purple-tipped; tenth stamen adnate for about ½ length of column; ovary brownish-pubescent.

Butte Co. (Humboldt Road, 3500 feet). July.

Var. **media** Jepson var. n. Leaflets rhombic-ovate, bluntish, minutely puberulent above; bracts round-ovate, abruptly short-acuminate, neither undulate nor keeled, caducous, nearly as long as the flowers; calyx a little more hairy than in the species, its lower tooth thickly sprinkled with saucer-shaped glands, the upper teeth with rather few glands or none; tenth stamen adnate ½ to 1 line.—(Foliola rhombi-ovata, obtusiuscula, supra minute puberula; bracteae rotundo-ovatae, abrupte acuminatae, caducae, flores fere aequantae; calyx paulo pubescentior.)—Priest Hill, Tuolumne Co., *A. L. Grant* 824 (type).

Refs.—PSORALEA HALLII Jepson. *Hoita hallii* Rydb. N. Am. Fl. 24:10 (1919), type loc. "Humboldt road, Butte Co.," *Hall* 9825. Var. MEDIA Jepson.

7. **P. macrostachya** DC. LEATHER ROOT. Stems in clusters, erect, 4 to 12 feet high; herbage variable, nearly glabrous, villous-pubescent or tomentose; leaflets rhombic-ovate, sometimes ovate-lanceolate, 1 to 3 inches long; peduncles commonly much exceeding the leaves; spikes broadly cylindrical, silky-villous with white hairs, mostly 9 to 10 lines broad; calyx 3 to 5 lines long, the lower tooth a little the longest, exceeding or equaling the petals, the 4 upper teeth short, broadly lanceolate; corolla purple, the lower portion of banner dull greenish; pods hairy, ovate-oblong, acute, flattened, 3 to 4 lines long.

Along the rivers and larger streams in the valleys, following the cañon bottoms in the mountains, and common in marshes and moist meadows, always in the richest soils, 5 to 3000 feet: Shasta Co.; Coast Ranges from Mendocino Co. to Santa Clara Co.; delta region of the Great Valley; coastal Southern California. South to Lower California. July-Oct.

Field note.—Of our native Psoraleas, P. macrostachya is the most common and most widely distributed. It appears, however, to be absent from or at least rarely collected or observed in the Sierra Nevada foothills, and there are few records for the South Coast Ranges and for the northern part of the North Coast Ranges. The roots furnished to the Pomos and other native tribes a tough fibre, which was regarded by the white settlers as the equivalent of hempen rope for toughness. The plants grow in spots of rich soil, doubtless enriched more or less by the plant itself, and are difficult to clear from land, even with a mattock, wherefore "California Hemp" of the ranchmen. It is the "Mootka" of the Pomo tribe. See V. K. Chesnut, Contrib. U. S. Nat. Herb. 7:358, for uses by the Concow and Yokia tribes.

Locs.—Coast Ranges: Ukiah Valley, *Jepson* 7641; Bachelor Valley, Lake Co., *Jepson;* Alexander Valley, Sonoma Co., *Jepson* 9483; Putah Creek, Winters, *Jepson* 13,594; Vaca Mts., *Jepson* 10,575 (Weldon Cañon), 13,592 (Gates Cañon); Howell Mt., *Jepson* 1734; Mt. Tamalpais, *Chesnut;* Joaquin Sprs., Mt. Hamilton (Erythea 1:80). Great Valley delta region: Suisun Marshes, *Jepson* 13,593; lower Sacramento River islands (Erythea 1:243); Bouldin Isl., lower Mokelumne River, *K. Brandegee.* S. Cal.: Ojai Valley, *Olive Thacher;* Sespe Creek, Ventura Co., *Munz* 9396; Santa Monica, *Barber* 15; Los Angeles, *Braunton* 668; Pasadena (McClatchie, Fl. Pasadena, 639); San Bernardino Valley, *Parish;* Riverside, *Jepson;* Cold Water Cañon, Santa Ana Mts., *E. A. Zumbro* 418; Palomar Mt., *Jepson;* Mission Valley, San Diego, *T. Brandegee.*

Refs.—Psoralea macrostachya DC. Prod. 2:220 (1825), type cited as from "Nootka", Vancouver Isl., an undoubted error, the specimen communicated by Lagasca having come most probably from San Diego or possibly Monterey; Jepson, Fl. W. Mid. Cal. 295 (1901), ed. 2, 233 (1911), Man. 560 (1925). *Lotodes macrostachyum* Ktze. Rev. Gen. Pl. 1:194 (1891). *Hoita macrostachya* Rydb. N. Am. Fl. 24:9 (1919). *H. rhomboidea* Rydb. l.c., resting on *P. macrostachya* var. *rhombifolia* Torr. U. S. Expl. Exped. 17:269 (1874), type loc. "upper Sacramento", *Brackenridge. Hoita longiloba* Rydb. N. Am. Fl. 24:10 (1919), type loc. "southern California", *Parry & Lemmon. H. villosa* Rydb. l.c., type loc. Burkes Sanitarium, Sonoma Co., *Heller* 5761.

8. **P. californica** Wats. Stems 5 to 8 inches long, ascending or prostrate, tufted on the often branched root-crown; taproot cylindric, 2 to 10 lines in diameter, arising from a deep-seated fusiform root; pubescence silky and appressed; leaves palmately compound; leaflets 5 or 6, orbicular-obovate, cuneate at base, ½ to 1 (or 1½) inches long; stipules scarious, lanceolate; racemes very much shorter than the leaves, dense, ¾ to 1 inch long, on short peduncles; bracts obovate, a little shorter than the pedicels; calyx silky-villous, 6 lines long, the linear-acuminate lobes a little shorter than the petals; petals blue, the banner greenish-yellow, blue-tipped; pods oblong, narrowed to a lanceolate beak, thin-walled, villous; seeds dark brown, 2 lines long or more.

Stony mountain slopes or summits in opens of wooded country, 1500 to 5300 feet: inner Coast Ranges from Glenn Co. to Mt. Diablo and Mt. Pinos; southern Sierra Nevada in Kern Co.; Santa Barbara Co.; San Bernardino Mts. South to Lower California. May-July.

This, a widely distributed species, is a relatively rare plant. It may sometimes be found on landslips. The odor of the herbage is said to be disagreeable. The banner at base shows a pair of somewhat sac-like distensions.

Locs.—Mud Flat, w. Glenn Co., *Heller* 11,548; Snow Mt., n. Lake Co., *T. Brandegee;* Mt. Diablo, *Jepson* 9657; Cedar Mt., s. of Livermore, *Elmer* 4466; Lorenzo Creek, s. San Benito Co., *Bettys;* Sacramento Creek, upper San Benito River, *Jepson* 12,205; Alcalde, peaks w. of (Zoe 4:172); Lockwood Valley, Mt. Pinos; San Bernardino Mts., n. base, *Parish* 1284. Kern Co.: Hot Sprs., Kernville, *T. Brandegee;* betw. Caliente and Bodfish, *Peirson* 10,686.

Refs.—Psoralea californica Wats. Proc. Am. Acad. 12:251 (1877), type loc. McGinnis Ranch near head of Salinas River 25 miles from San Luis Obispo, *Palmer;* Jepson, Fl. W. Mid. Cal. 295 (1901), ed. 2, 234 (1911), Man. 561 (1925). *Pediomelum californicum* Rydb. N. Am. Fl. 24:21 (1919). *Lotodes californicum* Ktze. Rev. Gen. Pl. 1:194 (1891). *Psoralea monticola* Greene, Erythea 3:98 (1895), type loc. summit of Mt. Diablo, *Greene.*

9. **P. castorea** Wats. Main stem erect, very short (mostly ½ to 1 or 2 inches), closely set with peduncled racemes and at very base with leaves on petioles 1 to 4 inches long, also sometimes bearing at base proliferous ascending or spreading stems 1 to 4 inches long; herbage white-pubescent; leaflets 5, rarely 3 or 4, obovate-rhomboid, obtuse, ¾ to 1¾ inches long; racemes oblong, 1 to 1½ inches long; bracts palmately 3-lobed or entire, inconspicuous, non-glandular, persistent; flowers 4 lines long; calyx a little shorter than the corolla (but accrescent in fruit), its lower lobe elliptic, the others subulate; tenth stamen free.

Sandy desert valleys or washes, 1500 to 2500 feet: central and eastern Mohave Desert. East to Arizona and Colorado. May.

Biol. note.—The main stem or shoot axis is generally short, erect, ½ to 2 inches high. It is borne on the crown of a slender vertical rootstock which, 3 to 4 inches below the surface, arises from a fusiform root or storage organ ½ to 1¼ inches in diameter and 3 inches or more in depth. The short erect epigaeous axis is somewhat crowded with peduncled racemes, and at base bears long-petioled leaves and often also produces, later, proliferous-like spreading or ascending stems 2 to 4½ inches long which bear terminal clusters of racemes. In this way Psoralea castorea tends to follow the general habit of various desert species in widely removed families which produce first a single terminal flower or single inflorescence on the very short main axis, and only under favorable conditions and at a later time supplementary flowers or inflorescences which proliferate from beneath the initial flowering. The fifth leaflet is sometimes borne on a distinct rachis.

Locs.—Victorville, comm. *Ethel Rockwell;* Barstow; Daggett, *Hall* 6154; Calico Mts., *Lemmon;* Otis, *Parish* 9725.

Refs.—PSORALEA CASTOREA Wats. Proc. Am. Acad. 14:291 (1879), type loc. "near Beaver City, s. Utah, on sandy ridges", *Palmer* 96; Jones, Zoe 4:28 (1893); Jepson, Man. 561 (1925). *Pediomelum castoreum* Rydb. N. Am. Fl. 24:22 (1919).

P. GLANDULOSA L. Sp. Pl. ed. 2, 1075 (1763); Greene, Fl. Fr. 16 (1891). Low shrub; leaflets narrowly lanceolate; racemes elongated, lax; corolla pale.—"In an old field near Berkeley where it may have been planted, July 10, 1881."—E. L. Greene in Gray Herb.

21. GLYCYRRHIZA L. LIQUORICE

Perennial herbs with glandular-viscid herbage. Leaves odd-pinnate, glandular-dotted. Flowers yellowish-white, in axillary peduncled spikes. Calyx 5-cleft, with the 2 upper lobes shorter or partly united. Stamens mainly diadelphous, the alternate anthers smaller. Ovary 2 to many-ovuled; style short and rigid, curved at the tip. Pod bur-like, densely beset with hooked prickles, in ours oblong, few-seeded, indehiscent.—Species about 12, all continents. (Greek glukus, sweet, and rhiza, root.)

1. **G. lepidota** Pursh. Stems erect, 2 feet high; herbage viscid-puberulent and sometimes with minute scales; leaflets 11 to 15, oblong- to ovate-lanceolate, 1 to 2 inches long; stipules linear-subulate; spikes broadly oblong, 1 to 1½ inches long; peduncles shorter than the leaves, ¾ to 3 inches long, with spreading glandular hairs; calyx very glandular; pod ½ to ¾ inch long, reddish-brown, 2 to 6-seeded.

Rich soil of low or moist lands in the valleys or on the plains, 10 to 7500 feet: throughout California. North to British Columbia, east to Ontario, south to Mexico. June.

Locs.—Middle Creek sta., Shasta Co., *Heller* 7958; Larrabee Creek, Eel River, *Tracy* 4668; Blue Lakes, Lake Co., *Jepson;* Vacaville, *Jepson* 10,572; Main Prairie, Solano Co., *Jepson* 13,600; Andrus Isl., lower Sacramento River, *Jepson* 13,597; Ione, Amador Co., *Braunton* 1086; Stockton, *Sanford;* Mt. Diablo, *Jepson* 13,599; Milpitas, *R. J. Smith;* upper San Benito River near Lorenzo Creek, *Jepson* 12,234; upper Cholame Creek, se. Monterey Co., *Jepson* 15,905; Pioneer Park, Cuyama River, *Jepson;* Silver Cañon, White Mts., *Jepson* 7211; Lone Pine, Inyo Co., *Jepson* 5142; Tehachapi Mts., *H. L. Bauer;* Rock Creek, n. side San Gabriel Mts., *Peirson* 588; Newberry; Victorville, *Jepson* 5611; Newhall (Proc. S. Cal. Acad. 1:7); Banning, *Gilman* 41; Elsinore River, *Alice King;* Temecula Cañon, Riverside Co., *Munz* 7132; San Diego Co. (Orcutt, Fl. S. & L. Cal. check-list 4).

Refs.—GLYCYRRHIZA LEPIDOTA Pursh, Fl. 480 (1814), type loc. "on the banks of the Missouri"; Jepson, Man. 561, fig. 551 (1925). *G. lepidota* var. *glutinosa* Wats.; B. & W. Bot. Cal. 1:144 (1876); Jepson, Fl. W. Mid. Cal. 293 (1901), ed. 2, 234 (1911). *C. glutinosa* Nutt.; T. & G. Fl. 1:298 (1838), type loc. Lewis River, *Nuttall.*

22. KENTROPHYTA Nutt.

Low tufted perennials with fine silky appressed pubescence and persistent odd-pinnate leaves. Lower stipules scarious, united on the side of stem opposite the leaf; upper stipules and leaflets rigid and awn-pointed. Peduncles axillary, bearing 1 to 3 small flowers. Calyx 5-cleft. Pod 1-celled, 1 to 2-seeded, included in the calyx. Stamens diadelphous (9 and 1). Seeds large for the size of the pod.—Species 2. (Greek kentron, spur or prickle, and phytum, plant.)

Peduncles almost as long as the leaves; leaflets linear-oblanceolate, the midrib not prominent........ 1. *K. tegetaria.*

Peduncles very short or almost none; leaflets subulate, the corneous midrib very prominent............ 2. *K. montana.*

1. **K. tegetaria** Rydb. Stems closely branched and the leaves crowded, forming dense mats 3 to 6 inches wide; herbage silky-canescent with ascending hairs; leaflets 5 to 7, mostly 6, narrow-oblanceolate, acute, cuspidate, conduplicate, 1½ to 2 lines long; peduncles (1 or) 2-flowered, 1 to 1½ lines long; flowers 1¾ to 2 lines long; calyx-teeth subulate or acerose, equaling the tube; corolla-banner pale purple, the white wings shorter, the whitish keel purple-tipped, shorter still; pods compressed, 2 lines long.

Dry flats or sagebrush slopes, 10,500 to 11,000 feet: White Mts. East to the desert ranges of Nevada. June.

Locs.—Cottonwood Creek, *Duran* 1628; Campito Mt., *Jepson* 7301.

Refs.—KENTROPHYTA TEGETARIA Rydb. Bull. Torr. Club 34:421 (1907). *Astragalus tegetarius* Wats. Bot. King 76, pl. 13, figs. 7–10 (1871), type loc. East Humboldt Mts., Nev., *Watson* 286.

2. **K. montana** Nutt. Stems several from the branched root-crown, forming a prostrate mat 3 to 15 inches wide; herbage grayish-strigose; leaves crowded, the 5 to 7 leaflets subulate, spine-tipped, 2 to 5 lines long, divaricate in age; peduncles hardly over 1 line long; calyx-teeth subulate-setaceous, much longer than the campanulate tube; corolla yellowish, 2 lines long; pods ovate, acuminate, sometimes elliptic, 2½ to 3 lines long.

Rocky alpine summits, (9500 or) 11,000 to 13,000 feet: both sides of the Owens Valley trough. East to New Mexico and Nebraska, north to Saskatchewan. June-Aug.

Locs.—Mt. Dana, *Chesnut & Drew;* Mt. Warren, *Congdon;* Wyman Creek, White Mts., *Duran* 1741.

Refs.—KENTROPHYTA MONTANA Nutt.; T. & G. Fl. 1:353 (1838), type loc. "hills of the Platte", *Nuttall;* Jepson, Man. 562, fig. 552 (1925). *Homalobus montanus* Britt.; Britt. & Br. Ill. Fl. 2:306 (1897). *Astragalus montanus* Jones, Rev. Astrag. 80 (1923); not A. montanus L. (1753). *Tragacantha montana* Ktze. Rev. Gen. Pl. 2:941 (1891).

23. **ASTRAGALUS** L. RATTLE-WEED. LOCO-WEED

Herbs with odd-pinnate leaves and persistent stipules. Flowers purple, pale yellow or white, in spikes, racemes or heads. Racemes mostly spike-like, often crowded. Calyx 5-toothed. Corolla usually long and narrow; keel mostly obtuse. Stamens diadelphous (9 and 1). Pod turgid, or inflated and bladder-like, sometimes not inflated, 1-celled or partly or completely 2-celled by the intrusion of one or both sutures, tardily dehiscent, 2 to many-seeded. Seeds small, usually reniform on slender funiculi.—Species about 950, common in all north temperate regions, many in South America, a few in Africa, none in Australia. (Ancient Greek name for some leguminous plant.)

Note on the natural units and on endemism.—Astragalus is one of the major genera of seed plants in California from the standpoint of number of species. Determination of the genetical values of the species rests mainly on the shape and size of the pod, its inflation, compression or obcompression, and degree of intrusion of the dorsal suture. The primitive condition of the pod is 1-celled (as in A. oophorus). The partially or wholly 2-celled condition is brought about by the intrusion of the dorsal suture which thus forms an ingrowing partition-fold. In some species the intrusion extends only part way to the opposite suture (A. mohavensis, A. rattanii), thus making the pod incompletely 2-celled, while in other species its extends to or even unites with the opposite suture, making the pod more or less completely 2-celled (A. breweri, A. nevinii, A. lentiginosus). This partition fold, when present, is usually quite constant in character. In some species (as in A. bolanderi) it does not extend throughout the entire length of the fruit but is lacking at the apical portion where the pod becomes narrow. When the mature pod dehisces the seeds, in such species, thus find exit through the open spaces between the partition and lateral walls. On account of the intrusion of the dorsal suture, grooved pods characterize certain species. In a few species pods may also be grooved ventrally (A. kernensis). The presence or absence of a stipe, the number of leaflets, the amount and more especially the character of the pubescence are also points well used in weighing the species. By means of these characters the natural units are rather readily defined and involve no such profound problem as is presented in the genera Lupinus or Lotus or even Trifolium. In addition to their technical characters the species here presented are enforced as natural units by plant habit, the peculiarities of which in each species are commonly distinctive and often singular or striking.

Difficulties in the genus result largely from the publication of species on the basis of flowering material, of immature fruiting specimens or of material so scanty as to invite mystery instead of clarity. If studies were restricted to long series of specimens with the flowering and fruiting stages fully coördinated our knowledge of Astragalus would soon present a happier and more promising aspect.

In California the genus is best developed in the deserts and bounding desert ranges. Only a few species occur in the Great Valley and only one has any wide distribution on the west slope of the Sierra Nevada above the foothills, namely Astragalus bolanderi. In the foothills only one species ordinarily occurs, the annual Astragalus gambelianus. On the arid slopes of the mountains bounding the Great Basin or the deserts there are, however, a large number of species with a marked proportion of endemics. The following extremely narrow endemics are found on the east slope of the Sierra Nevada or on the desert slopes of the mountains of Southern California: Astragalus webberi Gray in Plumas Co.; A. austinae Gray on Castle Peak, Nevada Co.; A. lemmonii Gray in Sierra Valley; A. lentiformis Gray in Red Clover Valley, Plumas Co.; A. inyoensis Sheld. and A. atratus var. mensanus Jones on the Darwin Mesa, Inyo Co.; A. panamintensis Sheld. in the Panamint Range; A. cimae Jones in the Providence Mts. region; and A. albens Greene in the region of Cushenbury Sprs., north side of the San Benardino Mts. These narrow endemics are known from only one station or from two or three near-by stations and with many other less restricted endemic species of the genus are all found outside the oval of the Great Valley.

Historically the genus in western North America represents marked differentiation. The tendency of the inflorescence to become capitate (as in A. rattanii, A. breweri or A. agrestis) is an indication of high specialization. The reduction of leaflets in certain species of extremely xerophytic aspect, such as A. serenoi, A. panamintensis and A. bicristatus, suggests a long period of adaptation to the arid condition of the environment. The tendency of the pod to become inflated or two-celled is evidence of a more advanced condition than exists in the other large genera of Leguminosae represented in California. The high number of specific units, the relative constancy of characters common to each species, and the restricted distribution of many of these species are all further indications of a highly specialized group. Altogether, Astragalus in western North America presents the view of a genus of ancient lineage which has long inhabited the area which it now occupies, and whose evolutionary tendencies have become relatively fixed by isolation and adaptation.

Note on the lethal qualities.—The herbage of Astragalus contains a poisonous principle which affects the nervous system of horses, cattle and sheep and causes abnormality of movement in the animal. Sometimes animals become uncontrollable and shy recklessly or run wildly. In extreme cases death results. For California only certain species are listed as poisonous, chiefly A. lentiginosus, A. hornii and A. mortonii, although others may be deleterious. Cf. Geo. Vasey, Plants poisonous to cattle in Cal. (U. S. Dept. Agr. Rep. 1874:159–160,—1875); C. D. Marsh, Loco Plants (U. S. Dept. Agr. Bull. 575:4–8,—1919) and The Loco Weed Disease (Farmer's Bull. 1054:1–19, figs. 1–11,—1919). Under the term Marihuana the herbage of a certain species, probably A. leucopsis, is used by native Mexicans in Southern California as a narcotic drug.

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A. Pods strongly inflated.

I. PODS 1-CELLED (SEED-BEARING SUTURE SOMETIMES SLIGHTLY INTRUDED).

1. Pods stipitate.

- Stems low and tufted.
  - Perennials.
    - Pods obovate, balloon-shaped, much rounded or obtuse at apex; leaves commonly grayish-puberulent; leaflets narrow; n. Sierra Nevada; Yollo Bolly Mts.; White Mts. 1. *A. whitneyi.*
    - Pods broadly spindle-shaped; leaves essentially glabrous; leaflets broad; White Mts. 2. *A. oophorus.*
  - Annual; pods broadly ovate, acute; Providence Mts.......................................3. *A. nutans.*

Stems 1 to 3 feet high, not tufted; perennials; upper San Joaquin Valley, inner South Coast Range and coastal S. Cal.

Pods acuminate at base and at apex; calyx-tube cylindric..........4. *A. oxyphysus.*

Pods rounded at base or obscurely acute, abruptly and shortly acute at apex; calyx-tube campanulate or cylindric..........5. *A. leucopsis.*

2. Pods not stipitate.

Perennials.

Pods glabrous or sparsely pubescent.

Seed-bearing suture somewhat intruded; stipules distinct.

Pods 5 to 8 lines long; west side Colorado Desert..........6. *A. vaseyi.*

Pods 1 to 1¾ inches long.

Pods ovoid, gradually acute at apex, barely 1 inch long; S. Cal..........7. *A. crotalariae.*

Pods oblong-ovate, abruptly acute at apex, 1 to 2 inches long; mostly South Coast Ranges and cismontane S. Cal.

Racemes loose or moderately dense, 7 to 9 lines wide; flowers ascending or spreading; banner at apex strongly upturned, commonly at a right angle..........8. *A. douglasii.*

Racemes dense, 11 to 13 lines wide; flowers spreading, at length deflexed; banner at apex not markedly upturned..........9. *A. pomonensis.*

Seed-bearing suture not intruded.

Stipules meeting or united on opposite side of stem from leaf; leaflets crowded; coastal from San Francisco south..........10. *A. vestitus.*

Stipules distinct; leaflets not crowded; Colorado Desert..........11. *A. preussii.*

Pods rather densely pubescent.

Stems 3 to 8 inches long; leaves ½ to 1⅛ inches long; ne. Cal..........12. *A. pulsiferae.*

Stems 1 to 4 feet long; leaves 3 to 6 inches long.

Pods oblong, 1 inch long; Monterey and San Luis Obispo Cos..........13. *A. macrodon.*

Pods ovate, ½ inch long; upper San Joaquin Valley and San Bernardino Valley..........14. *A. hornii.*

Annuals.

Pods strigulose; Inyo Co..........15. *A. triflorus.*

Pods densely pubescent or hoary; Colorado Desert.

Pods broadly ovate, 4½ lines wide; branches spreading from base..........16. *A. sabulonum.*

Pods narrowly ovate, 2½ lines wide; branches ascending..........17. *A. aridus.*

II. PODS COMPLETELY OR INCOMPLETELY 2-CELLED.

Flowers racemose; plants 4 inches high or more.

Pods not stipitate.

Pods not strictly globose, attenuate or tapering to apex.

Pods lanceolate, somewhat obcompressed, incompletely 2-celled; biennial..........18. *A. agninus.*

Pods ovate, markedly inflated, often purplish- or brown-mottled; perennial, biennial or annual; mainly deserts and east side of Sierra Nevada..........19. *A. lentiginosus.*

Pods globose, abruptly beaked by the stout persistent style; perennial; Mt. Whitney plateau..........20. *A. kernensis.*

Pods stipitate, ovate, inflated, 7 to 10 lines long; perennial; Sierra Nevada..21. *A. bolanderi.*

Flowers in small heads; plants 2 to 3 inches high; pods incompletely 2-celled, sessile; perennial; high Sierra Nevada..........22. *A. platytropis.*

B. Pods not at all inflated or only weakly so.

I. PERENNIALS (NO. 27 A BIENNIAL).

1. Pods resembling pellets of wool, densely white-woolly or white-villous, ½ to 1½ inches long.

Corolla crimson, 1¼ to 1½ inches long; pods broadly oblong, curved, 1 to 1½ inches long; peduncles equaling or exceeding the leaves; deserts..........23. *A. coccineus.*

Corolla white, or blue or purple and white, 7 to 11 lines long; peduncles usually shorter than the leaves; pods more or less curved, or more or less obcompressed, 6 to 12 lines long.

Leaves densely villous or white-tomentose.

Sierra Nevada (east side mainly), inner Coast Range, San Bernardino Mts.; pods commonly 1-celled, not usually grooved on back; plants matted, the peduncles and leaves arising from the branched root-crown, or sometimes borne on short stems..........24. *A. purshii.*

High montane axis of Southern California; pods 2-celled, strongly grooved on back; plants caespitose..........25. *A. leucolobus.*

Leaves silvery with a close dense appressed pubescence; pods 1 or 2-celled; leaves and peduncles tufted on the short branches of the root-crown; deserts....26. *A. newberryi.*

2. Pods pubescent or villous or glabrous, not resembling white pellets of wool.

a. Dorsal and ventral sutures both externally prominent, forming a thick cord-like ridge; pods coriaceous, strongly rugulose.

Pods hoary-pubescent, thin-walled, non-stipitate; biennial.......27. *A. mohavensis.*
Pods glabrous, fleshy-coriaceous, thick or subcylindric, short (½ to 1 inch long); perennials.
Pods stipitate; leaflets mostly 11 to 21.
Stipe not longer than calyx; pods linear-oblong, curved; leaflets narrowly linear; corolla white; Kern Co. region.......28. *A. pachypus.*
Stipe mostly longer than calyx; pods elliptic in outline, very thick or turgid, or somewhat subglobose, not curved; leaflets oblong; Siskiyou Co.......29. *A. pacificus.*
Pods not stipitate; leaflets 5 or 7, linear, very remote.......30. *A. serenoi.*

b. Dorsal suture not prominent and not cord-like externally (except in A. bicristatus), in 2-celled pods often inturned and forming a groove; pods not strongly rugulose.

Pods retrorsely and densely imbricated when mature; coast line species.
Pods 1-celled; style persistent.......31. *A. pycnostachyus.*
Pods incompletely 2-celled; upper portion of style deciduous.......32. *A. brauntonii.*
Pods erect, spreading or reflexed, but not retrorsely imbricated.
Pods 1-celled, glabrous, subglabrate or merely puberulent.
Pods strongly obcompressed, strongly or weakly curved, ¾ to 1¼ inches long.
Pods cristate fore and aft by the prominent sutures.
Leaflets usually remote, sparsely strigose; pods stipitate; San Gabriel and San Bernardino mountains.......33. *A. bicristatus.*
Leaflets approximate, silky-canescent; pods not stipitate; northern Sierra Nevada.......34. *A. webberi.*
Pods not cristate, not stipitate.
Leaflets remote, linear, minutely strigulose, ¼ to 1½ lines wide; calyx-teeth ⅙ to ¼ as long as the tube.......35. *A. casei.*
Leaflets approximate, obovate, glabrous or subglabrous, 1 to 2½ lines wide; calyx-teeth ½ to ¾ as long as the tube.......36. *A. iodanthus.*
Pods not obcompressed, stipitate.
Pods subcylindric.
Pods more or less curved, ¾ to 1 inch long; leaflets obcordate; Alpine Co. to Plumas Co.......37. *A. gibbsii.*
Pods straight, 1 to 1¾ inches long; leaflets oblong; Siskiyou Co.......38. *A. collinus.*
Pods strongly flattened laterally (except one form in A. trichopodus); leaflets linear or oblong.
Pods equilateral, 2 to 3 lines wide, the sides parallel.
Pods linear or linear-oblong; Siskiyou Co. to Lassen Co. and inner ranges of S. Cal.
Pods glabrous; stipe filiform; stems erect.......39. *A. filipes.*
Pods pubescent; stipe tapering; stems straggling.......40. *A. inversus.*
Pods oblong-oblanceolate; inner ranges, San Luis Obispo Co. to Los Angeles Co.......41. *A. antisellii.*
Pods inequilateral, 3 to 4 lines wide, the ventral suture straight or nearly so, the dorsal strongly curved; immediate coastal region, Santa Barbara Co. to Orange Co.......42. *A. trichopodus.*
Pods completely or incompletely 2-celled.
Mature pods obcompressed.
Pods strongly obcompressed, strongly arcuate, sessile; deserts.
Herbage glabrous; pods glabrous, 10 to 11 lines long; e. Mohave Desert.......43. *A. cimae.*
Herbage densely pubescent, or canescent; pods hairy, 1 to 2½ inches long; Mohave Desert and Inyo Co. deserts.......44. *A. layneae.*
Pods somewhat obcompressed, oblong, curved, pubescent, stipitate, the stipe 3 to 4 lines long.
Plants congested, the stems woody at base; herbage white-tomentulose; corolla white; insular.......45. *A. nevinii.*
Plants openly branching, the stems not woody at base; herbage more or less strigulose; corolla purple; Inyo Co.......46. *A. inyoensis.*
Mature pods not strongly obcompressed (slightly so in A. austinae and A. mortonii).
Pods stipitate, usually grooved dorsally, glabrous; stipe ⅔ to 1 line long.
Pods 3-sided or 3-angled, straight or only slightly curved; leaves canescent; deserts.......47. *A. tricarinatus.*

- Pods linear, flattened, curved; leaves glabrous or glabrate; corolla yellowish-white; Humboldt Co........48. *A. umbraticus.*
- Pods sessile or subsessile, compressed or cylindric.
  - Plants somewhat rush-like, the stems slender or wiry, caespitose or matted on the root-crown, 3 to 8 inches high; leaflets 5 to 13; pods erect or ascending; ranges and valleys east of the Sierra Nevada.
    - Pods flattened, the dorsal suture raised; corolla yellowish; racemes 1 or 2-flowered; herbage canescent; Panamint Range........49. *A. panamintensis.*
    - Pods cylindric or subcylindric, grooved dorsally; racemes mostly 3 to 8-flowered.
      - Herbage silvery-silky; corolla-banner purple, the wings white; e. Inyo Co........50. *A. calycosus.*
      - Herbage greenish, appressed-pubescent; corolla yellowish; Lassen and Modoc Cos........51. *A. obscurus.*
  - Plants with leafy stems, not rush-like.
    - Pods glabrous, reflexed, 2 to 2½ lines long; racemes 3 to 6 inches long; Lake Co........52. *A. clevelandii.*
    - Pods not glabrous.
      - Pods erect or ascending, straight or nearly straight.
        - Flowers capitate or in short (3 to 6 lines long) racemes; pods 2 to 3 lines long.
          - Stems slender, ½ to 2 feet long; herbage green, thinly strigulose, the calyces not white-woolly.
            - Pods ovate, acute, subcylindric, strongly grooved dorsally; racemes capitate........53. *A. lemmonii.*
            - Pods elliptic-oblong, obtuse, flattened, slightly grooved dorsally; racemes ½ inch long........54. *A. lentiformis.*
          - Stems stout, 2 to 4 inches long; herbage white with a dense silky pubescence, the calyces white-woolly........55. *A. austinae.*
        - Flowers in racemes or spikes, these (¾ or) 1½ to 6 inches long.
          - Racemes very dense or capitate; pods 4 to 6 lines long.
            - Calyx-teeth linear-subulate; pods densely pilose; Lassen Co........56. *A. agrestis.*
            - Calyx-teeth triangular; pods finely pubescent; Mono Co. to Modoc Co........57. *A. mortonii.*
          - Racemes lax, or at least not dense; pods white-shaggy, 6 to 10 lines long; e. Mohave Desert........58. *A. minthorniae.*
      - Pods reflexed or spreading, grooved dorsally.
        - Pods curved.
          - Racemes closely flowered, ¾ to 3 inches long; east of the Sierra Nevada.
            - Pods shaggy-villous, 1 inch long........59. *A. malacus.*
            - Pods densely tomentose, 6 to 8 lines long........60. *A. andersonii.*
          - Racemes loose, 2 to 4 inches long; pods strigulose, 1 line wide; central Sierra Nevada foothills........61. *A. congdonii.*
        - Pods straight, strigulose, the ventral margin cord-like; Inyo Co. 62. *A. atratus.*

II. ANNUALS; PODS NOT STIPITATE.

1. Pods elliptic-ovate or ovate, 2-seeded, strongly wrinkled or ridged transversely; flowers in short racemes or spikes.

- Pods erect, little exserted from the calyx........63. *A. didymocarpus.*
- Pods deflexed, well exserted from the calyx........64. *A. gambelianus.*

2. Pods linear or nearly so (oblong-ovate in no. 66), several to many-seeded, not wrinkled transversely.

- Flowers in racemes; pods compressed, curved, grooved dorsally, 2-celled; plants silvery or hoary-pubescent; deserts........65. *A. albens.*
- Flowers commonly in small head-like clusters at the ends of the peduncles; plants green or at least not strongly hoary-pubescent.
  - Pods not laterally compressed, completely or almost completely 2-celled.
    - Pods oblong-ovate, straight, silvery-pubescent; style in fruit stout, straight, as long as body of pod........66. *A. breweri.*

Pods cylindric or teretish, curved, green, grooved on the back; style in fruit short, curved or hooked, 1/7 to 1/10 as long as body of pod................................67. *A. tener.*
Pods laterally compressed, incompletely 2-celled, grooved dorsally.
Pods linear-attenuate, straight or curved, 2 inches long; North Coast Ranges.................. 68. *A. rattanii.*
Pods linear, ¾ inch long, curved; deserts..69. *A. nuttallianus.*

1. **A. whitneyi** Gray. Balloon Plant. (Fig. 207.) Stems tufted, 3 to 9 (or 12) inches high, from a woody base; herbage greenish to gray, somewhat strigose or hirsute-pubescent; leaves ¾ to 2½ (or 4) inches long; leaflets 13 to 19, distant, discrete or often crowded, linear to linear-oblong, 3 to 5 (or 7) lines long; flowers whitish or violet, 4 to 5 lines long, very short-pediceled, in racemes; racemes capitate, moderately dense, ¾ to 1¼ inches long; calyx-teeth subulate, ½ as long as the campanulate tube; corolla whitish or violet; pods strongly inflated, obovate, rounded at apex or very obtuse (balloon-shaped), 1-celled, ½ to 1½ or 2⅛ inches long, glabrous or scantily puberulent, mottled (at least when young), about 10-seeded, the stipe longer than the calyx.

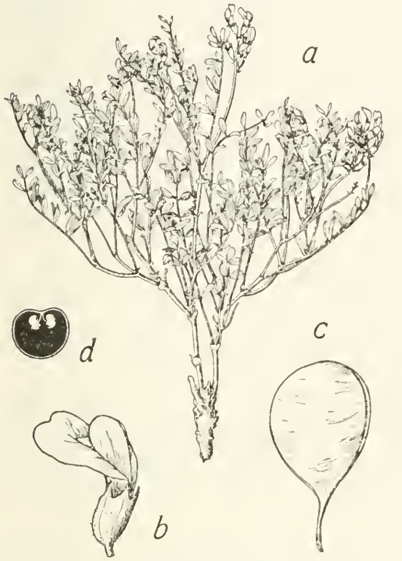

Fig. 207. Astragalus whitneyi Gray. *a*, habit, × ⅓; *b*, fl., × 1½; *c*, pod, × ¾; *d*, cross sect. of pod, × ⅜.

Mountain slopes, 5000 to 12,000 feet: Mt. Pinos; crests and east side of Sierra Nevada from Tulare Co. to Modoc Co.; Yollo Bolly Mts. to the Trinity Mts., inner North Coast Range. Western Nevada to eastern Washington. July, fr. July-Aug.

Geog. note.—The balloon-like fruits of Astragalus whitneyi are very remarkable and peculiar, and mark it well throughout its range. The original collection of the species represents, in a strict sense, a form of the east slope of the Sierra Nevada in Mono Co. with green or greenish scantily strigose herbage. Plants with more hairs in a varied degree and often with looser hairs are conspecific; the leaflets may be somewhat approximate or distant. The following stations are here cited: Mt. Pinos (var. pinosus Elmer); Kaweah Mdws., Tulare Co., *Purpus* 1799; Lundy, Mono Co., *Maud Minthorn;* Mt. Warren, Mono Co., *Congdon;* White Mts., Mono Co., *Shockley* (herbage grayish or greenish); Sonora Pass, *A. L. Grant* 335; Lake Tahoe vicinity, *V. de Witt-Warr.* Also Mt. Rose, Washoe Co., Nev., *Kennedy* 1185 (herbage rather gray).

Plants with short leaves, broader crowded leaflets and gray-hirsute herbage represent the state called var. sonneanus Jepson comb. n.: Deer Park, Placer Co., *Helen D. Geis;* Castle Peak, Nevada Co., *Sonne;* South Yollo Bolly, North Coast Ranges, *Jepson* 13,746; Trinity Mts. (18 mi. nw. of La Moine), *R. H. Sheppard.*

In all the above forms the pods are small (½ to 1⅜ inches long). The larger-podded form, typical of the state called A. hookerianus Gray, has pods 1½ to 2⅛ inches long and ¾ to 1¼ inches wide; it is found on the eastern side of the Sierra Nevada (Andrews Camp., nw. Inyo Co., *K. Brandegee;* Susanville, Lassen Co., *T. Brandegee;* Dixey Mts., Lassen Co., *M. S. Baker;* Goose Lake, Modoc Co., *R. M. Austin*) and extends north to Washington.

In the species Astragalus whitneyi, as here accepted, there is variation in amount and character of pubescence, in size of plants and in size of pods, in shape of leaflets and in approximation or remoteness of leaflets. No combination of these characters is consistently associated, so that it is impossible to separate the group into two or more definite units of even varietal value. While the large pods of the A. hookerianus form are very striking, we find every intergrade to the small pods of A. whitneyi. Intergrades occur as to all characters noted. We do not find any geographic segregation of significance.

Refs.—Astragalus whitneyi Gray, Proc. Am. Acad. 6:526 (1865), type loc. mts. near Sonora Pass, *Brewer* 1886. *Tragacantha whitneyi* Ktze. Rev. Gen. Pl. 2:949 (1891). *Phaca whitneyi* Hel. Muhl. 9:67 (1913). *A. hookerianus* var. *whitneyi* Jones, Proc. Cal. Acad. ser. 2, 5:668 (1895); Jepson, Man. 564 (1925). *A. whitneyi* var. *pinosus* Elmer, Bot. Gaz. 39:54 (1905), type loc. Mt. Pinos, *Elmer* 4005. *Phaca pinosa* Rydb. N. Am. Fl. 24:341 (1929). *A. hookerianus* var. *pinosus* Jepson, Man. 564 (1925). Var. SONNEANUS Jepson. *A. sonneanus* Greene, Pitt. 3:186 (1897), new name for *A. hookerianus* Gray. *Phaca lenophylla* Rydb. N. Am. Fl. 24:341 (1929), type loc. Tinker's Knob, Placer Co., *Sonne;* a synonym as evidenced by the type spm. (N. Y. Bot. Gard.). *P. siskiyouensis* Rydb. N. Am. Fl. 24:340 (1929), type loc. Mt. Eddy, Siskiyou Co., *Eastwood* 2006; a synonym as evidenced by the type spm. (N. Y. Bot. Gard.). *Phaca hookeriana* T. & G. Fl. 1:693 (1840), type from the interior of Ore., *Douglas. A. hookerianus* Gray, Proc. Am. Acad. 6:215 (1864); Jepson, Man. 564 (1925); not A. hookerianus Dietr. (1847). *Tragacantha hookeriana* Ktze. Rev. Gen. Pl. 2:945 (1891).

2. **A. oophorus** Wats. Spindle Loco. Stems many from the branched crown of a stout taproot, diffuse or ascending, forming a rounded clump 8 to 11 inches high; herbage glabrous or essentially so; leaves 3 to 7 inches long; leaflets 6 to 9 pairs, obovate to oval or suborbicular, obtuse, 2½ to 6 lines long; racemes short, 7 to 10-flowered, ¾ to 2 inches long; flowers 6 to 8 lines long; calyx-tube deeply bowl-shaped, its subulate teeth ⅔ as long; banner light purple, the wings white; pods strongly inflated, very broadly spindle-shaped, brown-spotted, 1-celled, 1½ to 1¾ inches long, 7 lines wide, stiped, the stipe little exceeding the calyx-tube.

High montane flats and slopes, in rocky places, 7200 to 10,000 feet: Panamint Range; White Mts. North into Nevada, east to Colorado and Arizona. May (fl.), July-Aug. (fr.).

Field note.—The small and relatively broad leaflets, bright green and very glabrous, characterize the leaves which tend to equal or nearly equal the flowers. The calyx is also quite glabrous.

Locs.—Telescope Peak, *Jepson* 7005; summit trail, Silver Cañon to Big Prospector Mdw., White Mts., *Jepson* 7253; Crooked Creek ranger sta., White Mts., *Duran* 1559; Benton, Mono Co., *Shockley* 114. Nev.: Summit sta., w. Mineral Co., *Shockley* 357.

Refs.—ASTRAGALUS OOPHORUS Wats. Bot. King 73 (1871), type loc. Reese River Pass, Shoshone Mts., Nev., *Watson* 278; Jepson, Man. 565, fig. 553 (1925). *Tragacantha oophora* Ktze. Rev. Gen. Pl. 2:947 (1891). *Phaca oophora* Rydb. N. Am. Fl. 24:338 (1929). *Phaca jucunda* Jepson & Rydberg, N. Am. Fl. 24:339 (1929), type loc. Telescope Peak, Panamint Range, *Jepson* 7005. *A. beckwithii* Cov. Contrib. U. S. Nat. Herb. 4:85 (1893), not T. & G., as evidenced by *Coville* 2022 (U. S. Nat. Herb.).

3. **A. nutans** Jones. Nodding Loco. Stem branched from base, 3 to 7 inches high; herbage strigose, gray, in age becoming green; leaves 1½ to 3 inches long; leaflets 9 to 13, oblong, 4 to 7 lines long; racemes ¾ to 1¼ inches long, 2 to 5-flowered; peduncles shorter than the leaves; flowers 3½ to 5 lines long; calyx-teeth narrow, about ¾ as long as the campanulate tube; corolla dark blue; pods broadly ovate, strongly inflated, membranous, 1-celled, 10 lines long, nodding, borne on a stipe barely equaling or little exceeding the calyx-tube.

Dry mesas, 3000 to 5000 feet: Providence Mts., eastern Mohave Desert. May (fr.).

Refs.—ASTRAGALUS NUTANS Jones, Rev. N. Am. Astrag. 108, pl. 12, fig. 53 (1923), type loc. Providence Mts., *T. Brandegee. Phaca nutans* Rydb. N. Am. Fl. 24:342 (1929). *A. deserticola* Jepson, Man. 565 (1925), type loc. Providence Mts., *T. Brandegee.*

4. **A. oxyphysus** Gray. Stanislaus Loco. Stems several from the base, rigid, erect, forming narrow compact clumps 2 to 3 feet high; herbage white-villous when young, soon becoming subglabrate and green; leaves 3½ to 4½ inches long; leaflets 15 to 23, oblong to linear-oblong, ½ to 1¼ inches long; racemes dense, 3 to 5 inches long, on peduncles longer than the leaves; flowers 7 to 8½ lines long; calyx-teeth triangular-subulate, ⅓ as long as the cylindric tube; corolla white or greenish-white; pods semi-obovate (i. e. the ventral suture nearly straight), inflated, 1-celled, 1½ to 2 inches long, with sharply pointed apex, at base attenuate into a recurved stipe 3 to 4 lines long; seeds numerous.

Hill cañons and dry plains, 400 to 2000 feet: inner South Coast Range from Stanislaus Co. to San Luis Obispo Co., thence southeast to the upper San Joaquin Valley and Tehachapi foothills. Mar.-Apr. (fl. and fr.).

Tax. note.—In the flowering stage this species much resembles A. leucopsis var. asymmetricus Jones. In habit of growth the two are similar and the youngest portion of the leafy shoots makes a white spot in the top of the plant with each species. In A. oxyphysus the pod itself is drawn down to a narrow or even clavate base above the stipe; in A. leucopsis var. asymmetricus the pod is rounded or obtuse at base or at most shortly acute.

Locs.—Mt. Hamilton Range (east side); Emmet, Tres Pinos Creek, San Benito Co., *Jepson* 12,405; Antelope School, Panoche Pass, *Jepson* 12,412; Devils Den road sta., nw. Kern Co., *Jepson* 16,247; Simmler (4 mi. s.), Carrizo Plain, *Jepson* 16,213; Famoso, *Jepson* 11,605; Bakersfield, *Davy* 1718; Tehachapi foothills near Caliente, *Jepson* 15,435.

Refs.—ASTRAGALUS OXYPHYSUS Gray, Proc. Am. Acad. 6:218 (1864), type loc. Arroyo del Puerto, Mt. Hamilton Range, *Brewer* 1259; Jepson, Fl. W. Mid. Cal. 292 (1901), ed. 2, 236 (1911), Man. 565 (1925). *Tragacantha oxyphysus* Ktze. Rev. Gen. Pl. 2:947 (1891). *Phaca oxyphysa* Hel. Muhl. 2:86 (1905).

5. **A. leucopsis** Torr. COAST RATTLEWEED. Stems erect or spreading, 1 to 3½ feet high; herbage greenish to canescent, the hairs more or less arcuate or wavy; leaves 2 to 5 inches long; leaflets 19 to 37, oval to oblong, obtuse, 2 to 9 lines long; racemes rather dense, 1 to 4 inches long, the pedicels short (½ to 1½ lines long), the flowers horizontally spreading; peduncles stout, 3 to 8 inches long, often twice as long as the leaves; flowers 5 to 9 lines long; calyx-teeth subulate, about ½ as long as the tube; corolla yellowish-white; banner often elongate, much exceeding the wings and keel; pods much inflated, oblong or ovate, abruptly short-acute, 1-celled, 1 to 1½ inches long; stipes straight or somewhat recurved, minutely appressed-pubescent, 3 to 6 lines long.

Sand dunes, dry cliffs or hillslopes near the coast, 5 to 100 feet: San Luis Obispo Co. to San Diego Co.; Santa Barbara Islands. South to Lower California. Feb.-Apr.

Locs.—S. Cal. coast: Morro, San Luis Obispo Co., *Barber;* Pt. Mugu, Ventura Co., *J. T. Howell* 3141; Pt. Dume, *Barber* 376; Redondo, *Braunton* 425; Santa Ana Cañon, Orange Co., *J. T. Howell* 2415; Oceanside, *Parish* 4454; Mt. Soledad, w. San Diego Co., *Newlon* 319; La Jolla, *Jepson* 11,843; Mission grade, San Diego, *Cleveland;* Coronado, *Berg.* Santa Barbara Islands: Santa Cruz Isl., *T. Brandegee;* Avalon, Santa Catalina Isl., *Trask.*

Var. **leucophyllus** Jones. HORSE LOCO. Young herbage silvery-pubescent, in age becoming green, the hairs straight or nearly so; leaflets linear to narrowly oblong, acute or obtuse, 6 to 10 (4 to 12) lines long; racemes 2 to 4 inches long; pods 1⅛ to 2 inches long; stipes very slender, usually very strongly recurved, ½ to 1⅜ inches long.—Low open dry hills in clay soil, 50 to 1200 feet: southern Solano Co.; inner South Coast Range from Contra Costa Co. to eastern San Luis Obispo Co.; San Joaquin Valley from eastern Contra Costa Co. and San Joaquin Co. to Madera Co. Apr.-July. This is the most common perennial Astragalus on the lower San Joaquin plain and in the inner South Coast Ranges opposite San Francisco Bay. The herbage is said to be poisonous to horses and sheep. While this variety is closely related to the species, the two do not overlap in their ranges so far as known to us, the species being quite littoral, the variety being confined to the arid Inner Coast Range hills and Great Valley plain.

Locs.—Solano Co.: Pellejo Hills, *Jepson* 13,761; Benicia, *Chandler* 6090; Rio Vista, *Jepson* 13,762. Inner South Coast Range: Mountain House, e. Alameda Co., *Jepson* 10,571; Livermore Valley, *Jepson* 13,764; betw. Mission San Jose and Sunol Valley, *Jepson* 13,760; San Lorenzo Creek, e. Monterey Co., *Hall* 9968; Cholame, e. San Luis Obispo Co., *Jepson* 15,892. San Joaquin Valley: Antioch, *K. Brandegee;* Byron, *Bioletti;* Bethany, San Joaquin Co., *C. F. Baker* 2818; Knights Ferry, Stanislaus Co., *Jepson* 10,568; Stanislaus River bridge near Ripon, *J. T. Howell* 2397; Modesto, *Bioletti;* Santa Rita bridge, w. Merced Co., *Jepson* 12,744; Mendota, *Jepson* 13,321; Madera, *Congdon.*

Var. **brachypus** Greene. Stipes barely equaling calyx.—San Miguel Isl.

Var. **curtipes** Jones. Herbage pubescent with short straight appressed hairs, becoming glabrate; stipules large, more or less connate; racemes dense, 1 to 2 inches long; pods much inflated, 14 to 18 lines long; stipe about 2 lines long, scarcely exceeding the calyx-tube.—Dry open hillsides, 5 to 500 feet: coastal San Luis Obispo Co.; San Miguel and Santa Rosa islands. Jan.-Apr.

Locs.—Chorro, *K. Brandegee;* San Luis Obispo, *Summers* 205.

Refs.—ASTRAGALUS LEUCOPSIS Torr. Bot. Mex. Bound. 56 (1859). *Phaca leucopsis* T. & G. Fl. 1:694 (1840). *P. canescens* Nutt.; T. & G. Fl. 1:344 (1838), type loc. Santa Barbara, *Nuttall,* not P. canescens H. & A. (1833). *Tragacantha leucopsis* Ktze. Rev. Gen. Pl. 2:946 (1891). *Phaca encenadae* Rydb. N. Am. Fl. 24:336 (1929), type loc. Ensenada, L. Cal., *Jones* 3672 (pods and upper leaf surfaces glabrous). *A. leucopsis* var. *lonchus* Jones, Rev. N. Am. Astrag. 119 (1923), type loc. San Diego, *Jones* 3083, a synonym as evidenced by the type spm. (Baker Herb.). Var. LEUCOPHYLLUS Jones, Contrib. W. Bot. 8:23 (1898). *A. leucophyllus*

T. & G. Fl. 1:336 (1838), type from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. 291 (1901), ed. 2, 235 (1911), Man. 565 (1925); not A. leucophyllus Willd. (1803). *Phaca leucophylla* T. & G. Fl. 1:694 (1840). *A. asymmetricus* Sheld. Minn. Bot. Stud. 1:23 (1894). *A. leucopsis* var. *asymmetricus* Jones, Contrib. W. Bot. 10:62 (1902). *Phaca asymmetrica* Rydb. N. Am. Fl. 24:335 (1929). Var. BRACHYPUS Greene, Pitt. 1:33 (1887), type loc. San Miguel Isl.; not A. brachypus Schrenk (1841). *A. leucopsis* var. *curtus* Sheld. Minn. Bot. Stud. 1:134 (1894). Var. CURTIPES Jones, Contrib. W. Bot. 10:62 (1902). *A. curtipes* Gray, Proc. Am. Acad. 6:217 (1864), type loc. San Luis Obispo, *Brewer;* Jepson, Man. 565 (1925). *Phaca curtipes* Rydb. N. Am. Fl. 24:337 (1929).

6. **A. vaseyi** Wats. Sentenac Loco. Trainasora. Stems ascending or at length procumbent, 1½ to 3 feet long; herbage silvery-canescent or the upper surface of the leaves glabrous; leaves 2½ to 4 inches long; leaflets 9 to 17, oblong, 5 to 7 lines long; racemes ½ to 2½ inches long; flowers 3 to 4 lines long; calyx-teeth subulate, little longer than the tube; corolla purple; pods inflated, narrowly ovate, tapering to a prominently acute apex, 1-celled, canescent, 5 to 8 lines long.

Dry slopes or in washes, 200 to 3000 feet: desert slopes of the San Jacinto and Cuyamaca mountains. Apr. (fl. and fr.).

Locs.—Palm Cañon of San Jacinto, *Jepson* 1345; Devils Cañon, Santa Rosa Mts., *Clary* 6; Coyote Cañon, sw. of Santa Rosa Mts., *Hall* 2829; Sentenac Cañon, *Jepson* 12,457; Wagon Wash near Sentenac Cañon, *Jepson* 8767; Box Cañon, Blair Valley, e. San Diego Co., *Jepson* 8703; summit of Mountain Springs Cañon, *Parish* 9087; Cuyamaca Mts., *Newlon* 464; Mountain Springs grade, *Peirson* 2899.

Var. **deanei** Jepson comb. n. Herbage glabrate; corolla white.—Sweetwater Valley, San Diego Co.

Refs.—ASTRAGALUS VASEYI Wats. Proc. Am. Acad. 17:370 (1882), type loc. Mountain Sprs., e. San Diego Co., *Vasey;* Jepson, Man. 566 (1925). *Phaca vaseyi* Rydb. N. Am. Fl. 24:354 (1929). *A. metanus* Jones, Proc. Cal. Acad. ser. 2, 5:666 (1895), type loc. Hanson's ranch, n. L. Cal., *Orcutt*, not "Brandegee" (type Univ. Cal. Herb.). *Phaca metana* Rydb. N. Am. Fl. 24:354 (1929). Var. DEANEI Jepson. *Phaca deanei* Rydb. l.c. 355, type loc. Sweetwater Valley, San Diego Co., *G. C. Deane.*

7. **A. crotalariae** Gray. Tawny Loco. Stems stout, erect or nearly so, 4 to 6 feet high; herbage glabrous or slightly pubescent, the calyces somewhat villous-pubescent; leaves 3½ to 7 inches long; leaflets 19 to 23, narrowly oblong to ovate-oblong, ½ to 1 (or 1½) inches long; peduncles shorter than the leaves, bearing dense or rather loosely flowered racemes; flowers 4 to 5 lines long; calyx-teeth triangular-subulate, nearly half as long as the campanulate tube; corolla tawny-yellow; pods of rather parchment-like texture, turgid and much inflated, ovoid, strongly and somewhat abruptly acute at apex, subglabrous or thinly strigulose, 8 to 11 lines long, 1-celled, the ventral suture projecting slightly inward.

Washes or dry hill slopes, 1500 to 4300 feet: mountains of eastern San Diego Co. and north to the Conchilla Range. Apr. (fl.), May (fr.).

Locs.—Eastern San Diego Co.: Ramona, *T. Brandegee;* Witch Creek, *Alderson;* Julian, *Jones;* Dulzura, *Newlon* 349; Grapevine Spr., *Jepson* 8761. Conchilla Range: Piñon Well grade, n. of Indio, *Jepson* 6005.

Var. **piscinus** Jepson comb. n. Herbage white or hoary with a short subappressed pubescence, tardily glabrate; calyx-teeth narrowly lanceolate or linear, ½ to ⅗ as long as the tube; corolla purple; pods more densely strigulose.—Eastern Colorado Desert (Algodones Sand Hills, *Jepson* 11,720). South into Lower California.

Refs.—ASTRAGALUS CROTALARIAE Gray, Proc. Am. Acad. 6:216 (1864), as to the name (but not as to the species), resting on *Phaca crotalariae* Benth. Pl. Hartw. 307 (1848), the type collected by *Coulter*, undoubtedly in the mountain range on the west side of the Colorado Desert, not "juxta Monterey". It may be noted that a number of Coulter's plants attributed to Monterey, such as Parosela mollis (Benth.) Hel., Astragalus coulteri Benth. and others, were undoubtedly collected in the Colorado Desert. Our identification of Phaca crotalariae Benth. is made at Kew by means of a specimen in the Kew Herbarium received from the Herbarium of Trinity College, Dublin. It is an isotype. We cite also: *A. crotalarioides* Torr. Bot. Mex. Bound. 56, t. 17 (1859), hyponym. *A. oocarpus* Gray, Proc. Am. Acad. 6:213 (1864), type loc. "mountains east of San Diego", *Parry;* Jepson, Man. 566 (1925). *Tragacantha oocarpa* Ktze. Rev. Gen. Pl. 2:946 (1891). *Phaca oocarpa* Rydb. N. Am. Fl. 24:343 (1929). Var. PISCINUS Jepson. *A. piscinus* Jones, Proc. Cal. Acad. ser. 2, 5:645 (1895), type loc. Lagoon Head, L. Cal., *Palmer.*

A. douglasii var. *piscinus* Jones, Contrib. W. Bot. 10:61 (1902). *Phaca piscina* Rydb. N. Am. Flora 24:345 (1929).

8. **A. douglasii** Gray. DOBIE LOCO. Stems many, ascending or decumbent, 1¼ to 3 feet high; herbage appressed-pubescent or in age glabrate; leaves 3½ to 6¼ inches long; leaflets 15 to 25, linear to oblong-linear, obtuse or retuse, 4½ to 12 lines long; racemes 1 to 2 (or 3) inches long, commonly loose; flowers spreading, 3 to 4 lines long; calyx-teeth subulate, ½ to ¾ as long as the campanulate tube; corolla white, yellow or greenish; pods remarkably inflated, oblong to ovate, abruptly very short-acute, thinly pubescent with short straight hairs or in age glabrate, 1-celled, 1 to 2 inches long, the ventral suture slightly intruded; seeds many.

Dry adobe or sandy flats, slopes or gulches in the hills, 180 to 4000 feet: western Yolo Co.; lower San Joaquin Valley plain; South Coast Ranges; Tehachapi Mts.; mountains of Southern California. May.

Note on variation.—The fruiting racemes are sometimes few-podded and loose, or sometimes many-podded and dense, with every gradation between. Throughout the range of the species the pods are commonly or often about one inch long, varying to two inches in length. Indifferently in the large-podded or small-podded states we find the seed-bearing suture barely intruded (Cahuilla Valley, sw. Riverside Co., *Jepson* 1472), slightly intruded (betw. Mossdale School and Atlanta, San Joaquin Co., *Jepson* 13,744), or intruded nearly 1 line (Bates sta., Fresno Co., *Jepson* 12,909). This character has, therefore, no importance in differentiating the species and its forms. If Astragalus douglasii be evaluated as to its outstanding characters and the features disregarded which are in the main individual or obviously fluctuating, we find a unit which is satisfactorily natural as above diagnosed. The specimens cited below may be regarded as fairly typical of the species.

Locs.—Western Yolo Co.: Buckeye Creek, Hershey, *Jepson* 8960. Lower San Joaquin Valley: betw. Mossdale School and Atlanta, San Joaquin Co., *Jepson* 13,744; Delhi, Merced Co., *Jepson* 12,747; Bates sta., Fresno Co., *Jepson* 12,909. Inner South Coast Ranges: San Benito River, *Hall* 9952; Big Chalone, Monterey Co., *Hall* 10,024; Santa Margarita Valley, *Brewer* 494; Huerhuero Creek, San Luis Obispo Co., *Barber* a23; Cholame, e. San Luis Obispo Co., *Jepson* 16,191; Palo Prieto Pass, se. San Luis Obispo Co., *Jepson* 12,023, 15,890. Tehachapi Mts.: Cameron, *Jepson* 15,877; Fort Tejon, *Jepson* 8938. S. Cal.: Bicknell sta., n. Santa Barbara Co., *Jepson* 12,673; Bell's sta., n. side San Gabriel Mts., *Davy* 2569; Arrastre Cañon, San Gabriel Mts., *Peirson* 397; Cahuilla Valley, *Jepson* 1472; Jacumba, *Cleveland;* Cuyamaca, *T. Brandegee;* Julian, *T. Brandegee.*

Var. **parishii** Jones. Plants more robust than in the species, 1½ to 3½ feet high; leaflets oblong, 4 to 9 lines long; peduncles 1½ to 3¾ inches long, about equaling the racemes; banner scarcely exceeding the wings; pods 1½ to 1¾ inches long.—Laguna, San Bernardino and San Gabriel mountains to the Tehachapi Mts., 4000 to 6700 feet.

Tax. note.—With the accumulation of material the differences between Astragalus parishii Gray and A. douglasii Gray have been reduced to a matter of size except for the shape and relative size of the petals. In extreme forms the banner of A. parishii is broader than in A. douglasii; it exceeds the wings by about ½ line, in A. douglasii by about 1½ lines. Variation in the one species, however, as to all organs, is about as great as variation between the two. Astragalus parishii is, therefore, accepted here only as a variety and should, doubtless, be reduced to complete synonymy.

Locs.—Laguna, e. San Diego Co., *Cleveland;* Strawberry Valley, Mt. San Jacinto, *Jepson* 1301; Santa Ana River, San Bernardino Mts., *Peirson* 4754; Bear Valley, San Bernardino Mts., *Parish;* upper Swartout Cañon, San Antonio Mts., *Hall* 1248; Kentucky Sprs., Los Angeles Co., *Barber* 204; Tehachapi, *K. Brandegee.*

Refs.—ASTRAGALUS DOUGLASII Gray, Proc. Am. Acad. 6:215 (1864); Jepson, Fl. W. Mid. Cal. 292 (1901), ed. 2, 236 (1911), Man. 566 (1925). *Phaca douglasii* T. & G. Fl. 1:346 (1838), type from Cal., *Douglas. Tragacantha douglasii* Ktze. Rev. Gen. Pl. 2:944 (1891). *A. tejonensis* Jones, Proc. Cal. Acad. ser. 2, 5:644 (1895), type loc. region near Tejon Pass, *Pringle, Jones;* a synonym as evidenced by type spm. (U. S. Nat. Herb.). *A. douglasii* var. *tejonensis* Jones, Contrib. W. Bot. 10:61 (1902). *Phaca tejonensis* Hel. Muhl. 2:85 (1905). *A. douglasii* var. *glaberrimus* Jones, Proc. Cal. Acad. ser. 2, 5:645 (1895), type loc. Los Huevelos, L. Cal., *T. Brandegee. Phaca glaberrima* Rydb. N. Am. Fl. 24:345 (1929). *P. pseudoocarpa* Rydb. l.c. 24:343 (1929), type loc. Cuyamaca Mts., *Palmer* 68; a synonym as evidenced by type spm. (N. Y. Bot. Gard.). Var. PARISHII Jones, Contrib. W. Bot. 8:6 (1898). *A. parishii* Gray, Proc. Am. Acad. 19:75 (1883), type loc. San Bernardino Co., *S. B. & W. F. Parish. Phaca parishii* Rydb. N. Am. Fl. 24:344 (1929). *P. perstricta* Rydb. l.c. 24:344 (1929), type loc. betw. Campo and Jacumba, San Diego Co., *Abrams* 3636; a synonym as evidenced by an isotype spm. (Dudley Herb.) and by a Bear Valley (San Bernardino Mts.) spm. authenticated as P. perstricta by Rydberg. *P. vallicola* Rydb. l.c. 24:343 (1929), type loc. Bear Valley, San Bernardino Mts., *S. B. & W. F. Parish* 1407d; a synonym as evidenced by type number (Dudley Herb.). *P. megalophysa* Rydb. l.c. 24:344 (1929), type loc. Swartout Cañon, San Antonio Mts., *Hall* 1531; a synonym as evidenced by the type spm. (Gray Herb.).

9. **A. pomonensis** Jones. Valley Loco. Very similar to A. douglasii; commonly stout; herbage greener, glabrous or subglabrous; leaves 4 to 6 inches long; leaflets 25 to 35, oblong, 7 to 15 lines long; racemes dense, 1 to 2½ inches long; flowers spreading or at length more or less deflexed, 5 to 6 lines long; corolla sometimes purple-tipped, the calyx ⅓ to ½ as long; fruiting racemes dense; pods 1 to 2 inches long.

Sandy soil, 10 to 2000 feet: San Luis Obispo and Santa Barbara Cos. near the coast; San Gabriel, San Bernardino and San Jacinto valleys; Conchilla Desert. Mar.-Apr., fr. Apr.-June.

Note on relationship.—Astragalus pomonensis is about intermediate between A. douglasii Gray and A. vestitus var. menziesii Jones. The appressed pubescence and often spreading flowers point towards A. douglasii; the congested racemes and usually ultimately reflexed flowers towards A. vestitus var. menziesii. The fruiting calyces may or may not persist on the rachis in either A. pomonensis or A. douglasii.

Locs.—Pismo, San Luis Obispo Co., *Jepson* 8443; Orcutt, Santa Barbara Co., *Jepson* 11,958; San Bernardino, *Parish;* Mill Creek Cañon near mouth, *Jepson* 5574; Banning, *T. Brandegee;* Conchilla Desert, *Jepson* 6085; Florida, San Jacinto Valley, *Jepson* 1250.

Refs.—Astragalus pomonensis Jones, Contrib. W. Bot. 10:59 (1902), type loc. Fallbrook, *Jones. Phaca pomonensis* Rydb. N. Am. Fl. 24:346 (1929). *P. densifolia* Torr. Pac. R. Rep. 4:80 (1857), not P. densifolia Sm. (1814).

10. **A. vestitus** Wats. var. **menziesii** Jones. Gray Loco. Stems erect or decumbent, 1 to 4 feet high; herbage grayish with appressed pubescence, often becoming green and glabrate; leaves 2½ to 5 inches long; leaflets usually many, oblong or oblong-obovate, retuse or obtuse, 6 to 10 lines long, closely set on the rachis; racemes dense, mostly 2 to 4 inches long, the stout peduncles nearly equaling the leaves; flowers 5 to 6 lines long, early reflexed; corolla whitish; pods ovoid, 1-celled, 1½ to 2 inches long, ¾ to 1¼ inches wide, very thinly pubescent with straightish hairs or glabrate, strongly inflated, the walls membranous.

Sandy flats or slopes, 10 to 100 feet: along the immediate coast line from San Francisco Co. to Santa Barbara Co. May-July.

Locs.—Pt. Lobos, San Francisco, *Jepson* 13,748; Pt. Pinos, *Jepson* 13,747; Pt. Joe, Monterey, *Jepson* 9747; Carmel, *Newlon* 99; Gorda, Monterey coast, *K. Brandegee;* San Simeon, *T. Brandegee;* Surf, *Berg.*

Var. **miguelensis** Jepson comb. n. Herbage white-tomentose but more or less glabrate; leaflets similar to var. menziesii; racemes sometimes very short or subcapitate; pods very finely tomentose.—San Miguel Isl.; Santa Rosa Isl.; Anacapa Isl. This variety is intermediate between the species and the var. menziesii.

Refs.—Astragalus vestitus Wats. Bibl. Ind. 202 (1878). *Phaca vestita* Benth. Bot. Sulph. 13 (1844), type loc. "Bay of Magdalena and San Quentin", L. Cal. *Tragacantha vestita* Ktze. Rev. Gen. Pl. 2:949 (1891). *A. anemophilus* Greene, Bull. Cal. Acad. 1:186 (1885), type loc. Cape St. Quentin, L. Cal., *Greene. A. crotalariae* var. *anemophilus* Jones, Contrib. W. Bot. 10:59 (1902). Var. menziesii Jones, Rev. N. Am. Astrag. 110 (1923). *A. menziesii* Gray, Proc. Am. Acad. 6:217 (1864), resting on Phaca densifolia Sm.; Jepson, Fl. W. Mid. Cal. 292 (1901), ed. 2, 236 (1911), Man. 566, fig. 554 (1925). *A. crotalariae* var. *menziesii* Jones, Contrib. W. Bot. 10:59 (1902). *Phaca densifolia* Sm.; Rees Cycl. 27: Phaca no. 7 (1814), type from Cal. (doubtless San Francisco or Monterey). *A. densifolius* Torr. Pac. R. Rep. 7:10 (1856), not A. densifolius Lam. (1783). *A. crotalariae* Gray, Proc. Am. Acad. 6:216 (1864), in part. (?)*A. crotalariae* var. *virgatus* Gray, Bot. Cal. 1:149 (1876), type loc. "about San Francisco Bay, *Bridges, Kellogg* or *Holder*". *Phaca virgata* Rydb. N. Am. Fl. 24:347 (1929). *A. franciscanus* Sheld. Minn. Bot. Stud. 1:135 (1894). *Phaca franciscana* Hel. Muhl. 2:217 (1906). *A. franciscanus* var. *longulus* Sheld. Minn. Bot. Stud. 1:135 (1894). *A. franciscanus* var. *virgatus* Ckll. Bot. Gaz. 26:437 (1898). *A. vestitus* var. *franciscanus* Jones, Rev. N. Am. Astrag. 110 (1923). *Phaca nuttallii* T. & G. Fl. 1:343 (1838), type loc. Santa Barbara, *Nuttall*, not A. nuttallianus DC. (1825). *P. inflata* Nutt.; T. & G. l.c. as synonym. *Tragacantha nuttallii* Ktze. Rev. Gen. Pl. 2:941 (1891). Var. miguelensis Jepson. *A. miguelensis* Greene, Pitt. 1:33 (1887), type loc. San Miguel Isl., *Greene. Phaca miguelensis* Rydb. N. Am. Fl. 24:348 (1929).

Phaca vestita Benth. (1844) clearly antedates Astragalus vestitus Boiss. & Heldr., Diagnoses Plantarum Orientalum Novarum, ser. 1, 9:98, dated 1849.

11. **A. preussii** Gray. NEVADA LOCO. Stems several or many from the root-crown, ascending, 7 to 15 inches high; herbage glabrous or essentially so; leaves 2½ to 3½ inches long; leaflets 11 to 15, orbicular to narrowly elliptic, obtuse or retuse, often cuneatish at base, 4 to 7 lines long; raceme 3½ inches long, the flowers very remote; peduncles 3 to 4 inches long; flowers 11 lines long; calyx-teeth lanceolate, ⅕ to ¼ as long as the tube; corolla purple; pods inflated, subcylindric, acute at base and apex, glabrous, 1-celled, 7 to 11 lines long, 3 to 4½ lines wide, borne on stipes 1½ to 2 lines long.

Sandy soil, 2000 to 4500 feet: western Nevada; southeast to Arizona, east to Utah. Apr.-May.

Locs.—Ash Mdws., Nev., *Purpus* 6042; Las Vegas, Nev., *T. & K. Brandegee;* Lees Ferry, Ariz., *Jones;* San Rafael Swell, Utah, *Jones.*

Var. **laxiflorus** Gray. Leaflets glabrous; flowers 5 to 5½ lines long; pods glabrous, narrow, sessile.—Antelope Valley, w. Mohave Desert, *Davidson.* East to northern Arizona.

Var. **limatus** Jepson. SAND LOCO. Robust plant of bushy outline, 1 to 2 feet high; herbage subglabrous or sparsely strigose, the upper surface of the leaves glabrous or glabrate; leaves 2½ to 5 inches long; leaflets obovate to oblong, obtuse or retuse at apex, 4 to 13 lines long; racemes 3 to 15-flowered, rather loose, 1 to 2½ inches long, on peduncles shorter or longer (in fruit) than the leaves; flowers 9 to 10 lines long; calyx-teeth triangular-lanceolate, about ⅓ or ¼ as long as the tube; pods oblong-cylindric or oblong-ovate to elliptic or elliptic-ovate, chartaceous-inflated, obscurely puberulent or glabrate, reticulate-veined, many-seeded, subsessile or barely stipitate, ¾ to 1¼ inches long, 5 to 6 lines wide.—Sandy flats, 10 to 1500 feet: Colorado Desert. Apr. (fl. and fr.).

Tax. note.—In general aspect, size of flowers and shape of pods the type spm. of var. limatus (Univ. Minn. Herb.) is very similar to the type spm. of the species (N. Y. Bot. Gard. Herb.). The two differ chiefly in that A. preussii has a stipe about as long as the calyx, while in the var. limatus the stipe is very short or almost none.

Locs.—This variety is very common on the Colorado Desert about Kane Sprs. (*Jepson* 12,544) and over the plain to Oasis road station (*Jepson* 11,710), as well as in the Borrego Valley (*Jepson* 8888). We cite also: betw. Indio and Westmoreland, *Newlon* 415; Travertine Terraces, Salton Sea, *Parish* 8425; San Felipe Creek, *T. Brandegee;* Split Mt., *T. Brandegee;* Brawley, *W. S. Childs;* Imperial, *Davy* 8021; Calexico, *Davy* 7990. The above spms. correspond well with the type spm.

Refs.—ASTRAGALUS PREUSSII Gray, Proc. Am. Acad. 6:222 (1864), type loc. "Rio Virgen", s. Nev., *Fremont. Tragacantha preussii* Ktze. Rev. Gen. Pl. 2:947 (1891). *Phaca preussii* Rydb. Bull. Torr. Club 40:47 (1913). *Rydbergiella preussii* Rydb. Fl. Rocky Mts. 501 (1917). Var. LAXIFLORUS Gray, Proc. Am. Acad. 13:369 (1878), type loc. Beaverdam on the Virgin River, Ariz., *Palmer. A. preussii* var. *laxispicatus* Sheld. Minn. Bot. Stud. 1:130 (1894), a renaming of last. *Phaca laxiflora* Rydb. N. Am. Fl. 24:363 (1929). *Phaca davidsonii* Rydb. N. Am. Fl. 24:362 (1929), type loc. Lancaster, Los Angeles Co., *Davidson* 4. Var. LIMATUS Jepson, Man. 566, fig. 555 (1925.) *A. limatus* Sheld. Minn. Bot. Stud. 1:126 (1894), type loc. Indian Wells, Colorado Desert, *Orcutt.*

12. **A. pulsiferae** Gray. GROUND LOCO. (Fig. 208.) Stems slender, prostrate, branching, 2 to 8 inches long, arising from the branched crown of a slender taproot; herbage (including mature pods) whitish-villous; leaves ½ to 1⅛ inches long, the 9 to 11 leaflets crowded; leaflets narrow-obovate, mostly retuse, 1½ to 4 lines long; racemes 1 to 7-flowered, 3 to 6 lines long, on peduncles 2 to 6 lines long; flowers 2 to 2½ lines long; pedicels in fruit often 2 to 4 lines long; calyx-teeth linear-filiform, longer than the tube; corolla white, purplish-tinged, 2 lines long; pods ovate-inflated, 1-celled, 4 to 6 lines long, 3 to 4 lines wide, 3 to 8-seeded.

Gravelly valley flats, 3500 to 4500 feet: northern Sierra Nevada from Plumas Co. to Modoc Co. East to Nevada. July.

Locs.—Sierra Valley; Genesee Valley, Plumas Co., *R. M. Austin* 34; Pine Creek, Lassen Co., *Baker & Nutting;* Chat, Lassen Co., *Davy.*

Refs.—ASTRAGALUS PULSIFERAE Gray, Proc. Am. Acad. 10:69 (1874), type loc. Plumas Co., *Mary E. Pulsifer Ames;* Jepson, Man. 567 (1925). *Tragacantha pulsiferae* Ktze. Rev. Gen. Pl. 2:947 (1891). *Phaca pulsiferae* Rydb. N. Am. Fl. 24:357 (1929).

13. **A. macrodon** Gray. JOLON LOCO. Essentially like A. douglasii; herbage commonly closely hairy, the young parts and the calyces very densely so and therefore white-hairy; pods densely puberulent.

Flats and hill slopes, 500 to 1300 feet: upper Salinas River valley and the neighboring hill country. June-July (fl. and fr.).

Tax. note.—In practically every particular save in the fruit, Astragalus macrodon is like A. douglasii, especially in details of inflorescence and flower, and in habit. The absolute and relative lengths of the calyx-teeth and calyx-tube vary within the same limits in the case of each species. It were then, perhaps, better to count it as a pubescent-fruited variety of A. douglasii. Its habits are very little known.

Locs.—Creston road near Paso Robles, *Jones;* Jolon, *K. Brandegee.*

Refs.—ASTRAGALUS MACRODON Gray, Proc. Am. Acad. 6:216 (1864); Jepson, Man. 567 (1925). *Phaca macrodon* H. & A. Bot. Beech. 333 (1838), type from Cal., *Douglas. Tragacantha macrodon* Ktze. Rev. Gen. Pl. 2:946 (1891). *A. holosericeus* Jones, Proc. Cal. Acad. ser. 2, 5:638 (1895), type loc. betw. King City and Jolon, Monterey Co., *Eastwood.*

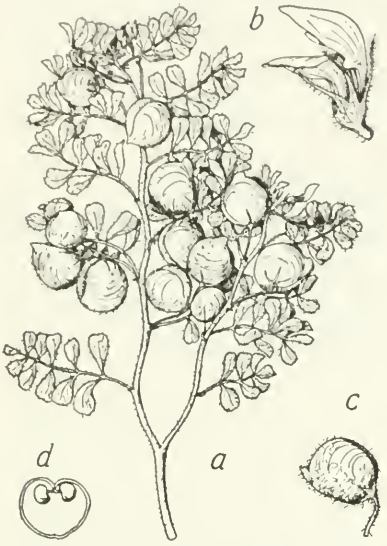

Fig. 208. ASTRAGALUS PULSIFERAE Gray. *a*, fl. branch, × ¾; *b*, fl., × 2½; *c*, pod, × 1; *d*, cross sect. of pod, × 1.

14. **A. hornii** Gray. SHEEP LOCO. Stems slender, widely spreading or prostrate, 3 to 4 feet long; herbage rather sparsely appressed-pubescent or the stems and upper surface of the leaves glabrate; leaves 3 to 5½ inches long; leaflets 15 to 31, narrowly oblong or linear, obtuse, 3 to 8 lines long; peduncles 2 to 7 inches long, divaricately or widely spreading, surpassing the leaves; spikes short or capitate, crowded; equally crowded in fruit (¾ to 1¾ inches long); flowers 3 to 4 lines long; calyx-teeth subulate, about as long as the campanulate tube; corolla yellowish-white; pods broadly ovate, acuminate, straight, 1-celled, 5 lines long, densely white-pilose when young, less conspicuously so when mature, 6 to 15-seeded.

Alkaline valley flats and plains, 400 to 1100 feet: upper San Joaquin Valley in Kern Co.; San Bernardino Valley. Lower California. Oct.

Field note.—This plant is considered poisonous to sheep. In the San Bernardino Valley it is now exterminated by cultivation according to a note by Parish in 1914. In 1873 it (with A. lentiginosus) was said to prevail quite abundantly over an area of 150 square miles in the upper San Joaquin Valley (U. S. Dept. Agr. Rep. 1874:159). A. hornii is still common in the Bakersfield region. We have no records from the Mohave Desert. The printed heading on the label of the type spm. of A. hornii (Gray Herb.) reads "Owens Valley and Fort Tejon", but there is no evidence that it occurs in the Owens Valley (as stated in Bot. Cal. 1:150), although it does occur in the Fort Tejon region.

Locs.—San Bernardino, *Parish* 2004; Bakersfield, *Leckenby.*

Var. **tularensis** Jepson comb. n. Herbage more pubescent; leaflets smaller and fewer, 13 to 17, the uppermost at least linear-oblong or oblanceolate; peduncles slender, 2 to 3 inches long; racemes ½ to 1 inch long; flowers 3½ lines long; pods smaller.—Upper San Joaquin Valley in Kern and Tulare Cos.: Bakersfield, *Hall* 8343.

Refs.—ASTRAGALUS HORNII Gray, Proc. Am. Acad. 7:398 (1868), type loc. Ft. Tejon, *Horn;* Parish, Zoe 4:103 (1890); Jepson, Man. 567, fig. 556 (1925). *Phaca hornii* Rydb. N. Am. Fl. 24:358 (1929). Var. TULARENSIS Jepson. *Phaca tularensis* Rydb. N. Am. Fl. 24:358 (1929), type loc. near Tulare Lake, *Lemmon.*

15. **A. triflorus** Gray var. **morans** Crum var. n. DEVIL'S LOCO. Stems tufted on a slender taproot, diffusely branched with short internodes, leafy, 1½ to 6 inches long; herbage whitish-pubescent; leaves many, ¾ to 2¼ inches long, the

petioles ¼ to 1¼ inches long, often exceeding the rachis; leaflets 7 to 11, oval to obovate or oblong, 1 to 6 lines long; racemes lax, few-flowered, 5 to 11½ lines long; peduncles ⅓ to 10½ lines long; flowers 3½ to 4 lines long; calyx strigulose, the broadly subulate teeth about ½ to ⅗ the length of the tube; corolla purple, the center of the banner marked with white lines; pods inflated, elliptic-ovoid, shortly acute, strigulose, minutely purple-dotted or finely blotched when young, tardily dehiscent, 1-celled, 9 to 11 lines long, deciduous from a minute stipe-like base; ovules 8 to 12; seeds ovoid, smooth, brown, sparsely purple-dotted, flattened, a deep hilar notch near the base.—(Caules ramosi, diffusi, foliosi, unc. 1½–6 longi; herbae albo-pubescentes; folia multa, unc. ¾–2¼ longa; petioli unc. ¼–1¼ longi; foliola 7–11, ovalia, obovata vel oblonga, lin. 1–6 longa; racemi laxii, pauciflori, lin. 5–11½ longi, flores lin. 3½–4 longi; calyx strigulosus, tubo dentibus late subulatis circa duplo longiore; corolla purpurea, vexillo medio albo-lineato; legumina strigulosa, inflata, elliptico-ovoidea, acuta, brevissime stipitate, tarde dehiscentia, uniloculata, lin. 9–11 longa.)

Desert cañons, 4000 to 5000 feet: Panamint Range.

Locs.—Hanaupah Cañon, *Coville & Gilman* 44 (type); Wild Rose Cañon, *Coville & Gilman* 35.

Refs.—Astragalus triflorus Gray, Pl. Wright. 2:45 (1853). *Phaca triflora* DC. Astrag. 62 (1802), type loc. volcano of Jorullo, Mex., *Humboldt*, acc. Gray l.c., not "Peru". Var. morans Crum.

16. **A. sabulonum** Gray. Gravel Loco. Stem diffusely branched from base, 2 to 10 inches high; herbage gray or grayish with close strigose pubescence, or when young silvery; leaves 1½ to 2 inches long; leaflets 9 to 15, linear-oblong, 3 to 5 lines long; racemes loose, rather few-flowered, ½ to 1½ inches long; flowers 2½ to 3 lines long; calyx-teeth lanceolate-subulate, a little longer than the tube; corolla white; pods incurved-ovate, short-acuminate, ½ to ¾ inch long, 1-celled, pubescent; seeds several.

Arid mesas, 50 to 500 feet: Colorado Desert. East to southern Utah. Apr.(fr.).

Locs.—Split Mt., *T. Brandegee;* Coyote Wells, *Newlon* 409; Indio, *Orcutt;* Hodges Mts., *Hall* 5976; McCoy Wash, *Hall* 5945. Nevada: Rhodes, Esmeralda Co., *Shockley* 355.

Refs.—Astragalus sabulonum Gray, Proc. Am. Acad. 13:368 (1878), type loc. se. border of Nev., *Palmer* in 1877; Jepson, Man. 568 (1925). *A. virgineus* Sheld.; Cov. Contrib. U. S. Nat. Herb. 4:88 (1893), type loc. valley of Virgin River, Nev., *V. Bailey* 1910.

17. **A. aridus** Gray. Explorers Loco. Stem freely branched from the base, 6 to 12 inches high; herbage and pods silvery-pubescent, often glabrate; leaves ½ to 1½ inches long; leaflets 9 to 15, oblong to obovate, 3 to 5 lines long; flowers few, 2½ lines long, in loose racemes on peduncles shorter than the leaves; calyx about half as long as corolla, the slender teeth about as long as the tube; corolla yellowish-white; pods sessile, narrowly ovate, somewhat incurved, inflated, markedly acute at apex, 5 to 6 lines long, 1-celled, several-seeded.

Dry mesas, sandy flats or alkaline plains, 10 to 1500 feet: Colorado Desert. Apr.

Locs.—Coyote Wells, *Newlon* 408; Carrizo Creek, *Orcutt* 2239; Vallecito, *Jepson* 8613; Borrego Sprs., *T. Brandegee;* Silent Cañon, se. end Santa Rosa Mts., *Jepson* 11,712b; Brawley, *W. S. Childs;* betw. Westmoreland and Indio, *Newlon* 422; Coachella, *Greata;* Mecca, *Parish* 8467; McCoy Wash, *Hall* 5937; Ft. Yuma (w. of), *Jones.*

Refs.—Astragalus aridus Gray, Proc. Am. Acad. 6:223 (1864), type collected betw. mouth of Gila River and San Diego, *Thurber;* Jepson, Man. 568 (1925). *A. albatus* Sheld. Minn. Bot. Stud. 1:128 (1894), type loc. Colorado Desert, *Orcutt. Tragacantha arida* Ktze. Rev. Gen. Pl. 2:943 (1891). *Phaca arida* Rydb. N. Am. Fl. 24:354 (1929). *P. arenicola* Rydb. N. Am. Fl. 24:356 (1929), type loc. Mecca, *Parish* 8467, supposedly a perennial.

18. **A. agninus** Jepson. Borrego Loco. Biennial; stems several from the base, decumbent, often zigzag, ½ to 1½ feet high; herbage hoary-canescent; stipules distinct, triangular, scarious; leaves 2 to 3 inches long; leaflets 7 to 13, obovate to oblong, obtuse or retuse, 3 to 5 lines long; raceme somewhat loose, 1½ to 2 inches long; flowers 4 lines long; calyx-teeth subulate, about ½ as long as the nar-

row-campanulate tube; corolla purple; pods lanceolate, somewhat curved, somewhat obcompressed, membranous, densely hoary-pubescent, grooved dorsally, very slightly if at all inflated, 7 to 9 lines long, the fold in-growing from the dorsal suture, extending nearly to the ventral suture or at least over half way; seeds 8 or 10; style slender, persistent in fruit and curved or hooked.

Gravelly mesas, 50 to 2200 feet: Colorado Desert; eastern Mohave Desert. East to Arizona. Apr. (fl. and fr.). Rarely collected.

Locs.—Borrego Sprs., *T. Brandegee;* Kelso, e. Mohave Desert, *K. Brandegee.* Yuma, Ariz., *Peebles & Harrison* 5029.

Refs.—ASTRAGALUS AGNINUS Jepson, Man. 577 (1925), type loc. Borrego Sprs., w. Colorado Desert, *Jepson* 8883. *Cystium agninum* Rydb. N. Am. Fl. 24:408 (1929). *A. lentiginosus* var. *borreganus* Jones, Contrib. W. Bot. 8:3 (1898), type loc. Borrego Spr., *Orcutt;* Rev. N. Am. Astrag. 126 (1923).

19. **A. lentiginosus** Dougl. SPOTTED LOCO. Stems several from the base, branched, 5 to 9 (or 12) inches high; herbage glabrous or sparsely strigose-pubescent; leaves 1 to 2½ inches long; leaflets 11 to 21, oblong to obovate, ¼ to ½ inch long; peduncles shorter than the leaves, bearing short-oblong densely crowded racemes; flowers 3 to 4 lines long; calyx-teeth lanceolate-subulate, ½ to nearly as long as the tube; corolla white or purple; pods broadly ovate, rather abruptly pointed, membranous-inflated, glabrous, straw-color (almost as if shining), incurved, often purplish-mottled, 5 to 7 lines long, more or less grooved along both ventral and dorsal sutures, 2-celled except at apex; seeds many.

Sandy flats or gravelly plains, 4000 to 6000 feet: eastern Washington and Oregon and south to western Nevada. Apr.-May, fr. May-July.

Locs.—Mathew Valley, e. Ore., *Leiberg* 2256; Malheur region, e. Ore., *Cusick* 1942; Reno, Nev., *T. Brandegee.*

Var. **fremontii** Wats. Ten to 18 inches high; herbage finely pubescent, grayish or greenish; flowers 4 to 5 lines long; calyx-teeth ¼ to ½ as long as tube; pods larger (6 to 12 lines long), strigose-pubescent.—Sandy flats and mesas, 2000 to 5000 feet: Mohave Desert and its bordering ranges to Inyo Co.

Locs.—Olancha, Inyo Co., *Almeda Nordyke;* Kessler Peak, Ivanpah Range, *Jepson* 15,833; Calico Wash, n. of Daggett, *Jepson* 5814; Kramer, *Jepson* 5326; Tehachapi, *Jones;* Mt. Pinos, *Hall* 6455; Lancaster, *Davidson;* Swartout Valley, *Peirson* 3194; Mt. San Antonio, *Parish* 1918; Bear Valley, San Bernardino Mts., *Parish.*

Var. **albifolius** Jones. Stems prostrate or ascending, 1 to 1¼ feet high; leaves 1 to 1¾ inches long, the petioles short (1 to 1½ lines) or almost none; leaflets oblong, conduplicate, acute at each end, whitish-pubescent, 4 lines long; spikes dense, 6 to 7 lines long, in fruit twice as long; flowers 3 lines long; pods oval-ovate, acute, 4 to 5 lines long.—Lower Owens Valley (Alabama Hills, *Jepson* 913); western Mohave Desert (Lancaster, *K. Brandegee*).

Var. **coulteri** Jones. Biennial; similar to var. fremontii; herbage hoary with a dense covering of short silky appressed hairs; pods densely pubescent with soft short hairs.—Sandy plains and flats, 50 to 2500 feet: northern Colorado Desert.

Locs.—Banning, *Gilman* 47; Whitewater, *Jepson* 11,631; Palm Sprs., Mt. San Jacinto, *Geo. B. Grant;* Garnet sta., Riverside Co., *J. T. Howell* 3439; Palo Verde, *Hall* 5958.

Var. **nigricalycis** Jones. (Fig. 209.) Stems stout, 1 to 1¼ feet high; herbage pubescent, grayish or greenish; leaves 2 to 4 inches long; leaflets 5 to 9 lines long; flowers 5 to 6 lines long, the calyces usually black-hairy; pods strongly ovate-inflated, tapering to a sharp point, coriaceous and dull, pubescent, 10 to 13 (or 16) lines long.—Temblor Range, south to the San Emigdio and Tehachapi ranges, and bordering plain of the San Joaquin Valley.

Locs.—Alcalde, *T. Brandegee;* Zapato Chino, sw. Fresno Co., *T. Brandegee;* Soda Lake, Carrizo Plain, *Jepson* 16,212; Famoso, Kern Co., *Jepson* 11,604; Bakersfield, *Davy* 1714; Wasco, Kern Co., *Munz* 10,110; Oil City, Kern Co., *Heller* 7587; Rose sta., Kern Co., *Jepson* 12,420; San Emigdio Cañon, Kern Co., *Davy* 1982; Tehachapi Valley, *Davy* 2184.

Var. **cuspidocarpus** Jones. Pods markedly coriaceous, oblong-ovate, a little obcompressed, usually strongly pointed, scantily strigose.—Siskiyou Co. to Modoc and Lassen Cos.; western Fresno Co.: Mayten, Siskiyou Co., *Alexander & Kellogg* 105; Montague, *K. Brandegee;* Grenada sta., Siskiyou Co., *Heller* 8062; Goose Lake, Modoc Co., *Austin & Bruce* 2210; Dixie Valley, Lassen Co., *Baker & Nutting;* Pine Creek, Lassen Co., *Baker & Nutting;* New Idria, Fresno Co.

Var. **ineptus** Jones. Pods thin, very short-pointed, small (5 to 6 lines long).—Montane, 4000 to 9000 feet: east slope of the Sierra Nevada from Mono Co. to Lassen Co.

Var. **sierrae** Jones. Stems several from a heavy root-crown, spreading, 8 inches long; leaves 9 to 12 lines long, bright green, nearly glabrous; leaflets rather crowded; pods subglobose, shortly pointed, 7 to 8 lines long.—San Bernardino Mts. (Bear Valley).

Var. **semotus** Jepson var. n. Stems numerous, slender or wiry, arising from a stout root-crown, prostrate or reclining, 3 to 6 inches long, the clusters of pods resting on the ground, the leaves rather stiffly erect, much exceeding the short racemes; herbage appressed-pubescent or the upper surface of the leaflets merely bordered by strigose hairs; leaves 2½ to 4 inches long, the petioles slender and wiry; leaflets 17 to 27, obovate, or oblong-oblanceolate, 1½ to 4 lines long; racemes few-flowered, ½ to 1½ inches long; flowers 4 to 5 lines long; calyx-teeth lanceolate-subulate, ½ to ¾ as long as the tube; corolla yellowish-white; pods ovate, beaked, sparsely strigulose, 6 to 9 lines long.—(Caules numerosi, graciles vel rigido-filiformes, prostrati vel reclinati, unc. 3–6 longi; folia unc. 2½–4 longa, paucifloros racemos superantia; foliola 17–27, obovata vel oblongo-oblanceolata, lin. 1½–4 longa; calycis dentes lanceolato-subulatis, quam tubo ¼–½ breviores; corolla albido-flavescens; legumina sparse strigulosa, lin. 6–9 longa.)—Dry flats or hill slopes, 7000 to 11,000 feet: White Mts., Inyo Co. June-July (fl. and fr.).

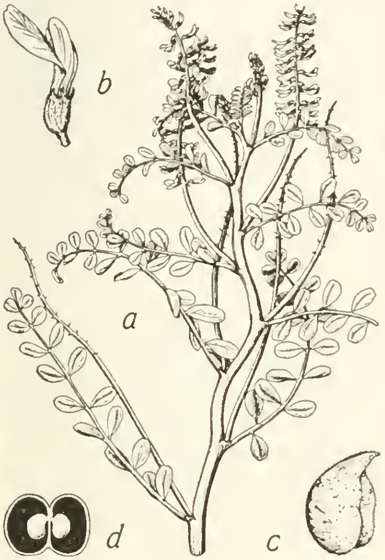

Fig. 209. ASTRAGALUS LENTIGINOSUS Dougl. var. NIGRICALYCIS Jones; *a*, fl. branch, × ¼; *b*, fl., × 1½; *c*, pod, × ½; *d*, cross sect. of pod, × 1.

Locs.—Campito Mt., *Jepson* 7280 (type); Summit trail, Silver Cañon to Big Prospector Mdw., *Jepson* 7250; Chiatovitch Creek, *Duran* 2776.

Refs.—ASTRAGALUS LENTIGINOSUS Dougl.; Hook. Fl. Bor. Am. 1:152 (1831), type loc. Blue Mts., Ore., *Douglas;* Jepson, Man. 568 (1925). *Tragacantha lentiginosa* Ktze. Rev. Gen. Pl. 2:946 (1891). *Cystium lentiginosum* Rydb. Bull. Torr. Club 40:50 (1913). *A. lentiginosus* var. *floribundus* Gray, Proc. Am. Acad. 6:524 (1865), type loc. near Carson City, Nev., *Anderson* 157, 247; type spm. (Gray Herb.), leaves rather short, racemes capitate, pods acuminate; we have seen no California spms. corresponding to this form. *Cystium floribundum* Rydb. N. Am. Fl. 24:411 (1929). *A. lentiginosus* var. *carinatus* Jones, Rev. N. Am. Astrag. 125 (1923), type loc. Baker City, Ore., *Jones.* Var. FREMONTII Wats. Bot. King 66 (1871). *A. fremontii* Gray; Torr. Pac. R. Rep. 4:80 (1857), type loc. Rio Virgen, *Fremont. A. coulteri* var. *fremontii* Jones, Proc. Cal. Acad. ser. 2, 5:669 (1895). *Cystium fremontii* Rydb. N. Am. Fl. 24:407 (1929). *A. eremicus* Sheld.; Cov. Contrib. U. S. Nat. Herb. 4:86 (1893), type loc. Lone Pine, *Coville* 888; a synonym as evidenced by type (U. S. Nat. Herb.). *Cystium eremicum* Rydb. N. Am. Fl. 24:409 (1929). *A. arthu-schottii* Gray, Proc. Am. Acad. 6:209 (1864), type loc. Mohave River, *Fremont,* in part. *Cystium arthu-schottii* Rydb. N. Am. Fl. 24: 409 (1929). *C. pardalotum* Rydb. N. Am. Fl. 24:415 (1929), type loc. Mohave Desert, *Davidson;* type spm. (N. Y. Bot. Gard.) fragmentary, without fruits; corolla purple. *C. vulpinum* Rydb. l.c. 24:409 (1929), type loc. Grass Valley, Nev., *Watson* 254; type spm. (Gray Herb.) less pubescent than is usual in var. fremontii, pods less pubescent, more closely congested but not capitate. Var. ALBIFOLIUS Jones, Rev. N. Am. Astrag. 124 (1923), type loc. Lone Pine, Owens Valley, *Jones. Cystium albifolium* Rydb. N. Am. Fl. 24:413 (1929). Var. COULTERI Jones, Contrib. W. Bot. 8:4 (1898). *A. coulteri* Benth. Pl. Hartw. 307 (1848), type loc. probably in Colorado Desert, *Coulter,* not "Monterey"; Jepson, Man. 568 (1925). *Tragacantha coulteri* Ktze. Rev. Gen. Pl. 2:944 (1891). *Cystium coulteri* Rydb. Bull. Torr. Club 40:50 (1913). *A. arthu-schottii* Gray, Proc. Am. Acad. 6:209 (1864), as to the Schott spm. (Gray Herb.). Var. NIGRICALYCIS Jones, Proc. Cal. Acad. ser. 2, 5:674 (1895), type loc. Bakersfield, *Eastwood. Cystium nigricalyce* Rydb. N. Am. Fl. 24:408 (1929). *Cystium tehachapiense* Rydb. N. Am. Fl. 24:414 (1929), type loc. Tehachapi, Kern Co., *Heller* 7833. Var. CUSPIDOCARPUS Jones, Proc. Cal. Acad. ser. 2, 5:673 (1895). *A. cuspidocarpus* Sheld. Minn. Bot. Stud. 1:147 (1894), type loc. Grafton, Mont., *R. S. Williams. A diphysus* Wats. Bot. King 65 (1871) in part, Toyabe and East Humboldt mountains, Nev., *Watson* 253; not A. diphysus Gray (1864). *Cystium platyphyllidium* Rydb. N. Am. Fl. 24:410 (1929), type loc. Pine Creek, Gilliam Co., Ore., *Leiberg* 171. *A. lentiginosus* var. *idriensis* Jones, Contrib. W. Bot. 10:63 (1902), type loc. New Idria, San Carlos Range, *Eastwood. Cystium idriense* Rydb. N. Am. Fl. 24:414 (1929). Var. INEPTUS Jones, Rev. N. Am. Astrag. 124 (1923). *A. ineptus* Gray, Proc. Am. Acad. 6:525 (1865), type loc. near Sonora Pass, *Brewer* 1878; type spm. (Gray Herb.) in flower only. *Phaca inepta* Rydb. Mem. N. Y. Bot. Gard. 1:246 (1900). *Cystium ineptum* Rydb. Bull. Torr. Club 32:659 (1905). Var. SIERRAE Jones, Rev. N. Am. Astrag. 124 (1923), type loc. Bear Valley, San Bernardino Mts., *Jones*, acc. to label on type spm. (Baker Herb.). Var. SEMOTUS Jepson.

20. **A. kernensis** Jepson. KERN LOCO. Stems many, slender, 3 to 4 inches high, from the woody crown of a stout root; herbage strigose-pubescent with stiffish hairs, the upper surface of the leaflets merely bordered by strigose hairs; stipules scarious, distinct; leaves 1 to 2 inches long; leaflets about 13, obovate, obtuse or retuse, 1½ to 2½ lines long; racemes short, rather closely 4 to 6-flowered, the whitish flowers 4½ lines long; calyx-teeth subulate, about half the length of the narrow-campanulate tube; banner notched, its sides turned abruptly back; wings involute-tubular, shorter than banner, turning bluish; keel shorter than wings; pods globose, membranous-inflated, abruptly beaked with the stout persistent style, more or less grooved along both sutures, sparsely hirsutulose, 3 lines long, 2-celled; seeds about 4.

High montane, 8000 to 8500 feet: Whitney plateau, east side of the upper Kern River. July (fl. and fr.).

Locs.—Monache Mdws., *Purpus* 1871; Natural Bridge, Volcano Creek, *Hall & Babcock* 5432.

Refs.—ASTRAGALUS KERNENSIS Jepson, Man. 569 (1925), type loc. Volcano Creek, Tulare Co., *Jepson* 4930. *Cystium kernense* Rydb. N. Am. Fl. 24:413 (1929).

21. **A. bolanderi** Gray. SIERRA LOCO. Stems many, erect or decumbent, from the branched crown of a heavy woody root, 9 to 12 inches high; herbage pubescent; stipules scarious, the lower united on the side of the stem opposite the leaf; leaves 3 to 6 inches long; leaflets 9 to 23, linear to narrowly oblong; peduncles not exceeding the leaves, bearing a short crowded 6 to 12-flowered raceme; flowers 5 to 7 lines long; calyx-teeth slender-subulate, a little shorter than the tube; corolla straw-color, or purplish-tinged; pods narrowly ovate-inflated, incurved, coriaceous, glabrous, veiny, 7 to 10 lines long, on a stipe equaling or slightly exceeding the calyx, more or less grooved along both sutures, 2-celled save that the apical ⅓ is partitionless; seeds 12 or 14.

Gravelly or sandy flats or openly wooded slopes, 5200 to 9000 (or 10,800) feet: Sierra Nevada from Tulare Co. to Nevada Co. June-July.

Field note.—Astragalus bolanderi Gray is a frequent species of the Sierra Nevada at middle and higher altitudes, forming great colonies in opens or flats in the Western White Fir (Abies concolor) forest. On these sandy spots it is frequently associated with Eriogonum nudum. The flowers are ascending in a dense short spike. After fertilization the flowers spread horizontally and the spike appears quite loose, the fruit soon growing rapidly. The banner of the corolla is narrow, slightly cleft at apex and turned backward; the wings are strictly erect in the line of the calyx, revolute from the upper edge or sometimes tending to coil from the tip, the two slightly divergent.

Locs.—Sand Mdw., South Fork Kaweah River, *Jepson* 4673; Farewell Gap, *Jepson* 1005; Alta Peak, Kaweah River, *Hopping* 64; Mt. Silliman, *Jepson* 724; Line Creek, Huntington Lake, *Jepson* 12,996; Crescent Lake, Mariposa Co., *Congdon;* Peregoy Mdw., Mariposa Co., *Jepson* 4341; Mt. Ralston, Eldorado Co., *Helen Geis* 19; Bowman Lakes, Nevada Co., *A. M. Carpenter.*

Refs.—ASTRAGALUS BOLANDERI Gray, Proc. Am. Acad. 7:337 (1868), type loc. Ostrander Ranch, above Yosemite, *Bolander;* Jepson, Man. 568, fig. 557 (1925). *A. supervacaneus* Greene, Erythea 1:221 (1893), type loc. mts. of Fresno Co., *Nutting. Tragacantha bolanderi* Ktze. Rev. Gen. Pl. 2:943 (1891). *Hesperonix bolanderi* Rydb. N. Am. Fl. 24:440 (1929).

22. **A. platytropis** Gray. ALPINE LOCO. Peduncles and leaves tufted on the branched root-crown, 1 to 3 inches high; herbage silvery-pubescent; leaves ¼ to 2 inches long; leaflets 7 to 13, obovate or oblong, 1½ to 3 lines long; racemes capitate, 5 or 6-flowered, on slender scape-like peduncles, the peduncles about equaling the leaves; flowers 3 to 4 lines long; calyx-teeth subulate, nearly as long as the tube; corolla yellowish-white with purplish keel, 3½ to 4½ lines long; pods turgid-ovate, very short-pointed, scantily strigulose, sometimes purplish-mottled, 2-celled except at the apex, 1 inch long.

Sandy gravelly slopes, 8600 to 10,000 feet: near Sonora Pass. East to Utah and Montana. July (fl. and fr.).

Field note.—Astragalus platytropis has been seldom collected. Its inflated pod, so large as to be quite out of proportion to its diminutive alpine plant body, marks well this species, which is very rare in California (with only one known station).

Locs.—Sonora Pass. Nevada: Lee Cañon, Charleston Mts., *Heller* 11,005; Schellbourne, *Jones.*

Refs.—ASTRAGALUS PLATYTROPIS Gray, Proc. Am. Acad. 6:526 (1866), mt. near Sonora Pass, *Brewer;* Jepson, Man. 569 (1925). *Tragacantha platytropis* Ktze. Rev. Gen. Pl. 2:947 (1891). *Phaca platytropis* Rydb. Mem. N. Y. Bot. Gard. 1:246 (1900). *Cystium platytrope* Rydb. Bull. Torr. Club 40:50 (1913).

23. **A. coccineus** Bdg. SCARLET LOCO. Stems densely tufted on the crown of a stout taproot, 3½ to 6 inches high; herbage densely white-silky; leaves 2 to 4 inches long; leaflets 11 to 15, obovate to broadly ovate, obtuse, 3 to 6 (or 7) lines long; spikes numerous, 1 to 7-flowered, the flowers short-pedicellate, crowded near the top; calyx about half as long as the corolla, the linear-subulate teeth about ⅓ the length of the cylindrical tube; corolla scarlet, straight, 1¼ to 1½ inches long; pods oblong, 1-celled, 1 to 1½ inches long.

Rocky cañon walls or mountain slopes in arid ranges, 3000 to 8000 feet: west side of the Colorado Desert; San Bernardino Mts.; Inyo Co. East to Charleston Mts., Nev. Apr.-May.

Locs.—Astragalus coccineus is a very distinct species and a remarkably showy one, inhabiting the desert ranges. It is on the whole rather infrequent, but may be cited as follows: Mountain Sprs., e. San Diego Co., *Parish* 9025; Cuyamaca Mts., *Newlon* 360; Box S Sprs., s. Mohave Desert, *M. S. Baker* 2909c; Quail Sprs., Conchilla Range, *Munz* 5221; Hanaupah Cañon, Panamint Range, *Jepson* 7093; Lone Pine, *T. Brandegee;* Silver Cañon, White Mts., *Heller* 8190; Black Cañon, White Mts., *Duran* 2626.

Refs.—ASTRAGALUS COCCINEUS Bdg. Zoe. 2:72 (1891); Jepson, Man. 573, fig. 563 (1925). *A. purshii* Dougl. var. *coccineus* Parry, W. Am. Sci. 7:10 (1890), type loc. Mountain Sprs., mts. w. side of Colorado Desert, San Diego Co., *Orcutt,* the number being 1514, acc. to the spm. label. *A. grandiflorus* Wats. Proc. Am. Acad. 17:370 (1882), type loc. San Bernardino Mts., *S. B. & W. F. Parish;* not A. grandiflorus L. (1753). *Xylophacos coccineus* Hel. Muhl. 2:217 (1906).

24. **A. purshii** Dougl. WOOLLY LOCO. Stems very short, 2 to 4 (or 8) inches long, arising from a branched root-crown and forming densely matted tufts; herbage densely white-villous; leaves 1¼ to 3 inches long; leaflets 7 to 13 (or 15), oblong-oblanceolate or narrowly obovate, 3 to 5 (or 6) lines long; peduncles shorter than the leaves; racemes short, 3 to 6-flowered, the rachis 1 to 5 lines long; flowers 7 to 11 lines long; calyx-teeth slender-subulate, ¼ to ½ as long as the narrow tube; corolla white or white and blue; pods oblong, somewhat obcompressed, 1-celled, somewhat curved (especially at tip), densely clothed with long white or yellowish hairs so as to appear like pellets of wool, 6 to 8 (or 10) lines long; beak none or the pod with a short acute apex.

Gravelly soil, 3500 to 5000 feet: east of the northern Sierra Nevada in Lassen and Modoc Cos. North to British Columbia, east to the Rocky Mts. May (fl.), June (fr.).

Note on the pod.—The dorsal suture is not at all intruded in the specific form of Astragalus purshii. In A. inflexus Dougl., a plant of the Columbia River region with 2-celled fruits, the dorsal suture is always intruded, so as to make a strong groove along the back of the pod. So far as known this species does not enter the borders of northern California. There are, however, named varieties of A. purshii in which the dorsal or both sutures are more or less intruded.

Locs.—Diamond Mt., Lassen Co., *Jones;* Honey Lake, *T. Brandegee;* Big Valley, Lassen Co., *Baker & Nutting;* Egg Lake, Modoc Co., *M. S. Baker.*

Var. **tinctus** Jones. Corolla purple.—Dry hills and plains, 2700 to 8000 feet: Siskiyou Co. to Modoc Co., thence south along the east side of the Sierra Nevada to Inyo Co.

Locs.—Humbug, Siskiyou Co., *Butler* 631; Butcher Hill, Yreka, *Butler* 708; Edgewood, Siskiyou Co., *Kisling;* Goose Lake, Modoc Co., *R. M. Austin;* Ft. Bidwell, *Manning* 97; West Valley, Warner Mts., *L. S. Smith* 773; Truckee, *Sonne;* Trail Cañon, White Mts., *Duran* 2748.

Var. **incurvus** Jepson comb. n. Calyx-teeth linear-subulate, ½ to ⅔ as long as the tube; pods partially 2-celled by the intrusion of both sutures.—Lassen Co.: Chat, *L. S. Stephenson.*

Var. **lectulus** Jones. Plants congested, 1½ to 4 inches high, the stems very short; leaflets fewer; peduncles shorter; flowers smaller (4 to 7 lines long), probably purplish; pods somewhat incurved, smaller (3 to 8 lines long).—High montane, 4000 to 10,000 feet: San Bernardino Mts.; Sierra Nevada, east slope or east side; inner North Coast Range from Mendocino Co. to Siskiyou Co.

Locs.—San Bernardino Mts.: Rose Mine, *Parish* 2997; Bear Valley, *Parish* 1812. White Mts.: Chiatovitch Flats, *Duran* 2560. Sierra Nevada: Lone Pine, Inyo Co., *Jones;* Bishop, foothills w., *Heller* 8318; Leevining Creek, Mono Co., *Ottley* 1077; Sonora Pass, *A. L. Grant* 318; Jess Valley, Warner Mts., *L. S. Smith* 47. Inner North Coast Range: South Yollo Bolly, *Jepson* 13,754; Marble Mt., w. Siskiyou Co., *Chandler* 1679.

Var. **gavisus** Jepson var. n. Plants prostrate or nearly so, forming mats 8 to 10 inches wide; herbage pubescent with long silky wool; peduncles short, few-flowered, not exceeding the leaves; calyx-tube 4 lines long, the teeth 1½ to 2 lines long; pods strongly arcuate, somewhat obcompressed, acutely long-beaked, ¾ to 1 inch long.—(Plantae prostratae vel subprostratae, sericato-lanatae; pedunculi breves, pauciflori, folia non superantes; calycis tubus lin. 4 longus, dentibus lin. 1½–2 longis; legumina unc. ¾–1 longa, paulo arcuata, manifeste obcompressa, acute longirostrata.)—Scott River Valley, Siskiyou Co., *T. H. Gilbert* (type).

Var. **longilobus** Jones. Peduncles usually exceeding the leaves; calyx-teeth sometimes elongate; pods somewhat obcompressed, often strongly arcuate, acutely long-beaked, 7 to 9 (or 15) lines long; beak straightish, strongly inflexed, ⅕ to ½ as long as the body.—Ranges near or bordering the desert, 3700 to 5000 feet: San Carlos Range; San Emigdio Mts.; Tehachapi Mts.; southern Sierra Nevada in Kern Co.; east to the Nelson and Panamint ranges, Inyo Co.

Locs.—San Benito Peak, San Carlos Range, *Jepson* 2711; Mt. Pinos, *Hall* 6538; San Emigdio Cañon, *Davy* 2038; Tejon Mts., *Coville & Funston* 1196; Gorman sta., Tejon Pass, *Parish* 1890; Tehachapi Peak, *Dudley* 314; Cameron, *Feudge;* Erskine Creek, s. Sierra Nevada, *Purpus* 5658; Greenhorn Range, e. side, *Hall & Babcock* 5072; Nelson Range, Inyo Co., *Hall & Chandler* 7152; Willow Creek, Panamint Range, *Coville & Funston* 783.

Var. **funereus** Jepson comb. n. Similar in habit to and doubtless belonging to the A. purshii group and most closely allied to var. longilobus; flowers 12 to 13 lines long; calyx conspicuously black-hairy, often much inflated, the inflation due to the rapid growth of the young pod; corolla-banner oblong, making a wide angle with the wings and keel; pods about 2 inches long (acc. Jones); beak stout, acuminate, 4 lines long.—Western Nevada. Attributed to California but we have seen no spms. from the state.

Var. **ordensis** Jepson comb. n. Herbage loosely white-woolly; leaves 2½ to 3½ inches long; leaflets oblong or obovate, 4 to 6 lines long; peduncles slightly exceeding the leaves; flowers purple, 7 to 9 lines long; calyx black-hairy; pods oblong, somewhat obcompressed, slightly to strongly arcuate, nearly 2-celled by the intrusion of the dorsal suture.—Desert ranges, 5100 to 6100 feet: Mohave Desert (Granite Well, *Johnston*); Inyo Co. (Millspaugh, Argus Mts., *Hall & Chandler* 7076; Hanaupah Cañon, Panamint Range, *Jepson* 6995).

Refs.—ASTRAGALUS PURSHII Dougl.; Hook. Fl. Bor. Am. 1:152 (1831), type loc. "Spokane River, Northwest America," *Douglas;* Jepson, Man. 572 (1925). *Tragacantha purshii* Ktze. Rev. Gen. Pl. 2:947 (1891). *Phaca purshii* Piper, Contrib. U. S. Nat. Herb. 11:369 (1906). *Xylophacos purshii* Rydb. Bull. Torr. Club 32:662 (1905). *A. purshii* var. *interior* Jones, Rev. N. Am. Astrag. 222 (1923), type loc. North Park, Colo. (the first locality mentioned). Var. TINCTUS Jones, Zoe 4:269 (1893), "Edgewood near Mt. Shasta and in Ventura Co.," *T. Brandegee;* Jepson, Man. 572 (1925). *Phaca purshii* var. *tincta* Piper, Contrib. U. S. Nat. Herb. 11:369 (1906). *A. candelarius* Sheld. Minn. Bot. Stud. 1:142 (1894), type loc. near Candelaria, Esmeralda Co., Nev., *Shockley. Xylophacos candelarius* Rydb. Bull. Torr. Club 52:370 (1925). *A. candelarius* var. *exiguus* Sheld. l.c. 143, type loc. "road to Sierra Valley, Nevada Co.," *Sonne. Xylophacos subvillosus* Rydb. Bull. Torr. Club 52:368 (1925), type loc. Sierra Valley, *Lemmon;* probably belongs here rather than under the species. Var. INCURVUS Jepson. *Xylophacos incurvus* Rydb. Bull. Torr. Club 52:366 (1925), type loc. east of the northern Sierra Nevada, *Lemmon* 75. Var. LECTULUS Jones, Contrib. W. Bot. 10:61, pl. 6, (1902); Jepson, Man. 572 (1925). *A. lectulus* Wats. Proc. Am. Acad. 22:471 (1887), type loc. Bear Valley, San Bernardino Mts., *Parry, Parish. A. purshii* var. *interior* Jones, Rev. N. Am. Astrag. 222 (1923) in part. *Xylophacos lectulus* Rydb. Bull. Torr. Club 52:371 (1925). *X. argentinus* Rydb. Bull. Torr. Club 52:371 (1925), type loc. Lone Pine, *Jones.* Var. GAVISUS Jepson. Var. LONGILOBUS Jones, Zoe 4:269 (1893), type loc. Tehachapi, *Brandegee;* Jepson, Man. 572 (1925). *A. amphioxys* Cov. Contrib. U. S. Nat. Herb. 4:85 (1893), not Gray, as evidenced by *Coville & Funston* 496, 543 (U. S. Nat. Herb.). *A. consectus* Sheld. Minn. Bot. Stud. 1:143 (1894) in part, type loc. Tejon Pass, *Parish* 1890. *Xylophacos consectus* Rydb. Bull. Torr. Club 40:49 (1913), in part. Var. FUNEREUS Jepson. *A. funereus* Jones, Contrib. W. Bot. 12:11 (1908), type loc. Rhyolite, Nev., *Jones. Xylophacos funereus* Rydb. Bull. Torr. Club 52:367 (1925). Var. ORDENSIS Jepson. *A. inflexus* var. *ordensis*

Jepson, Man. 573 (1925), type loc. Ord Mt., Mohave Desert, *Jepson* 5877. *A. inflexus* var. *flocculatus* Jepson, Man. l.c., fig. 564, type loc. Hanaupah Cañon, Panamint Range, *Jepson* 6999.

25. **A. leucolobus** Jones. MOUNTAIN LOCO. Peduncles and leaves caespitose on the branched root-crown, 2 to 5 inches high; herbage hoary throughout with dense soft pubescence; stipules triangular, 2 to 3 lines long; leaves 1½ to 4 inches long; leaflets 11 to 19, obovate to oblong, 2½ to 6 lines long; peduncles equaling or exceeding the leaves; racemes rather loosely 3 to 10-flowered, the rachis 3 to 15 lines long; flowers 7 to 8 lines long; calyx-tube densely villous, its teeth triangular-subulate, ¼ as long; corolla purple and white; pods narrowly oblong, markedly obcompressed, incurved, broadly grooved dorsally, acute to rather long-beaked, densely tomentose, nearly or quite 2-celled except at apex, by intrusion of the dorsal suture, 8 to 12 lines long.

Mountain slopes, 6000 to 8500 feet: Santa Rosa Mts. to the San Bernardino and San Gabriel mountains. May-June.

Field note.—On Le Montaine, north of Big Pines, San Antonio Mts., at 7250 feet, Astragalus leucolobus seems, says Frank W. Peirson, to prefer north slopes and the shade of pines. It often covers the ground over considerable areas and the individual plants frequently form mats which are in June or July surrounded by a circle of the deciduous pods.

Locs.—Santa Rosa Peak, *Jepson* 1448; Fish Creek, San Bernardino Mts., *J. Grinnell* 34; Bear Valley, San Bernardino Mts., *Parish* 3744, 1813; Le Montaine, San Antonio Mts., *Peirson* 3167; Swartout Valley, San Antonio Mts., *Munz* 4614.

Var. **subvestitus** Jepson var. n. Racemes not exceeding the leaves; flowers 5 to 6 lines long; calyx-tube 2½ lines long, the teeth about 1 line long; banner and wings narrower than in the species, subequal, both exceeding the keel; pods ovate or ovate-oblong, shortly pubescent, incompletely 2-celled, the body 3 to 6 lines long, the beak ½ to 1¾ lines long; dorsal suture somewhat intruded.—(Racemi folia non superantes; flores lin. 5–6 longi; calycis tubus lin. 2½ longus, dentibus circiter lin. 1 longis; legumina ovata, breviter pubescentia, lin. 3–6 longa, rostrata, sutura dorsali intrusa in loculos 2 imperfecte divisa.)—Rocky slopes or sandy flats, 4000 to 5000 feet: southern Sierra Nevada in Kern and Tulare Cos.

Locs.—Erskine Creek, Kern Co., *Purpus* 5098 (type); Monatchee Mdws., Tulare Co., *Purpus* 1853.

Refs.—ASTRAGALUS LEUCOLOBUS Jones, Zoe 4:270 (1893), type loc. Bear Valley, San Bernardino Mts., *Parish*. *Phaca leucoloba* Hel. Muhl. 2:85 (1905). *Xylophacos leucolobus* Rydb. Bull. Torr. Club 52:371 (1925). *A. purshii* var. *leucolobus* Jones, Contrib. W. Bot. 10:61 (1902). *A. inflexus* var. *leucolobus* Jepson, Man. 573 (1925). Var. SUBVESTITUS Jepson.

26. **A. newberryi** Gray. SILK LOCO. Peduncles and leaves densely congested on the short stems of the branched root-crown, 1½ to 5 inches high; herbage densely white-silky, the hairs appressed; leaves 1 to 2½ inches long; petioles usually exceeding the rachis; leaflets 5 to 11, elliptic- to oblong-obovate, 3 to 6 lines long; peduncles sometimes exceeding the leaves; racemes short or capitate, (1 or) 2 to 7-flowered, the rachis 1 to 3 lines long; flowers 10 to 12 lines long; calyx-tube white- or black-hairy, 3 to 5 lines long, the linear or subulate teeth 1 to 2 lines long, sometimes blackish; corolla purple; pods oblong to ovate-oblong, obcompressed, arcuate, shaggy-villous, 1-celled, 7 to 11 lines long, the dorsal suture either not at all intruded or deeply so.

Rocky slopes, 3800 to 5000 feet: eastern Mohave Desert; Inyo Co. East to Utah and New Mexico. Apr.-May (fl. and fr.).

Field note.—The peduncles curve sickle-like in age, and then reflex. They become indurated and persist for several years, often forming on the bases of the root-crown branches a loose thatch.

Locs.—Barnwell, e. Mohave Desert, *Parish* 9659; Leastalk, New York Mts., *Parish* 10,311; Providence Mts., *T. Brandegee* (dorsal suture of pod deeply intruded). At the following Inyo Co. stations the plants are in pubescence somewhat intermediate towards A. purshii Dougl.: Keeler, *T. Brandegee;* Owens Valley, *T. Brandegee;* Olancha, *T. Brandegee.*

Var. **castoreus** Jones. Habit more open; peduncles 2 to 5 inches long; calyx more or less black-hairy, its teeth 1½ to 1¾ lines long.—White Mts. (Black Cañon at Marble Fork, 5900 feet, *Duran* 2723); New York Mts. (Barnwell, *Parish* 10,424). East to Utah.

Refs.—ASTRAGALUS NEWBERRYI Gray, Proc. Am. Acad. 12:55 (1876), type loc. "frontiers of Utah and Arizona," *Newberry*. *A. chamaeleuce* Gray, Bot. Ives 10 (1860), as to the plant of

Newberry. Xylophacos newberryi Rydb. Bull. Torr. Club 32:662 (1905). *A. candelarius* var. *exiguus* Sheld. Minn. Bot. Stud. 1:143 (1894), in part, as to Utah spms. cited. Var. CASTOREUS Jones, Proc. Cal. Acad. ser. 2, 5:658 (1895), type loc. Copper Mine, St. George, Utah, *Jones* 5006.

27. **A. mohavensis** Wats. MOHAVE LOCO. Stems much-branched, from a somewhat woody base, ¼ to 1 foot high; herbage silky-villous with appressed hairs, or the stems glabrate; stipules triangular, distinct; leaves 1½ to 2½ inches long; leaflets about 11, roundish-obovate to oblong-obovate, 3 to 6 lines long; racemes loosely few-flowered, the peduncles shorter than the leaves; calyx-teeth narrow, about equaling the turbinate tube; corolla blue, 4½ to 5 lines long; pods oblong, somewhat flattened, coriaceous, rugulose, incompletely 2-celled, hoary-pubescent, 6 to 9 (or 12) lines long, both sutures prominent and cord-like externally; seeds many.

Montane slopes, 4000 to 8000 feet: desert ranges from the eastern Mohave Desert to the Death Valley region. Southwestern Nevada. May.

Locs.—Providence Mts., *T. Brandegee;* Hanaupah Cañon, Panamint Range, *Jepson* 6955; Telescope Peak, *Jepson* 7004; Keeler, Inyo Co., *T. Brandegee.* Nev.: Good Sprs., *Jones;* Amargosa Desert, *Jones.*

Refs.—ASTRAGALUS MOHAVENSIS Wats. Proc. Am. Acad. 20:361 (1885), type loc. Newberry Spr., Mohave Valley, *Lemmon;* Jepson, Man. 569, fig. 558 (1925). *Brachyphragma mohavense* Rydb. N. Am. Fl. 24:400 (1929).

28. **A. pachypus** Greene. BUSH LOCO. Bushy plant, erect, 1½ to 4 feet high; herbage densely silvery-puberulent, the leaves soon glabrate, especially above; leaves 3 to 5 inches long; leaflets 15 to 21, narrowly linear, retuse or obtuse, 4 to 12 lines long; racemes loosely few-flowered, equaling the leaves; calyx-teeth subulate, equaling the campanulate tube; corolla pure white, soon becoming sordid, 8 lines long; pods narrowly oblong, slightly incurved when mature, incompletely 2-celled, ¾ to 1 inch long, shortly thick-stiped, fleshy when young, in age coriaceous and rather strongly rugulose, both sutures extremely prominent and cord-like; seeds about 12.

Dry hillslopes, 2000 to 6300 feet: Tehachapi Mts., west to the Cuyama Valley; recurring in southwestern Riverside Co. May-June (fl. and fr.).

Geog. note.—Astragalus pachypus Greene, a singular and well-marked species, is peculiar to the mountains which form a crescent about the extreme southerly end of the San Joaquin Valley from the headwaters of the Cuyama River easterly through the Tehachapi Mountains to Hackberry Creek in the lower Kern River country. This range is consistent with the general law of distribution of plant species in this region. It has been attributed to Cajon Pass, but this is a clerical error for Tejon Pass. The outlying station on the Temecula River in Riverside Co. is quite anomalous and mystifying.

Locs.—Caliente, *K. Brandegee;* Rowen, Tehachapi Mts., *Jepson* 6734; Seymour Creek, Mt. Pinos, *Munz* 6981; Cuyama Valley, Santa Barbara Co., *Eastwood;* Tejon Pass, *Parish* 9223; Dripping Spr., Temecula River, *Peirson.*

Refs.—ASTRAGALUS PACHYPUS Greene, Bull. Cal. Acad. 1:157 (1885), type loc. Bealville, Kern Co., *Curran;* Jepson, Man. 569, fig. 559 (1925). *Brachyphragma pachypus* Rydb. N. Am. Fl. 24:401 (1929).

29. **A. pacificus** Sheld. SISKIYOU LOCO. Stems erect or ascending from a stout rootstock, 1 to 2 feet high; herbage thinly pubescent; leaves 2½ to 4 inches long; leaflets 9 to 19, oblong, usually cuneate at base, sometimes obovate, retuse, 3 to 9 lines long; petioles short (mostly 3 to 7 lines long); racemes short (¾ to 1¼ inches long), loosely flowered, the peduncles equaling or exceeding the leaves; calyx-teeth slender, nearly equaling the tube; corolla yellowish, 5 to 7 lines long; pods elliptic, 2-celled, very turgid, about as thick as broad, abruptly mucronate, 6 to 11 lines long, 4½ to 5½ lines wide, glabrous, fleshy-coriaceous, strongly rugulose, reflexed or ascending, borne on a stipe nearly twice as long as the calyx-tube, the ventral suture externally prominent and cord-like, the dorsal suture less so; seeds 8 or 10.

Dry slopes, 4000 feet: Siskiyou Co. North to Oregon. July (fr.).

Locs.—Yreka, *Butler* 706; Hornbrook, *Copeland* 3512. Southern Ore.: Ashland, *Henderson* 224.

Refs.—Astragalus pacificus Sheld. Minn. Bot. Stud. 1:174 (1894); Jepson, Man. 570 (1925). *A. hendersonii* Wats. Proc. Am. Acad. 22:471 (1887), type loc. Siskiyou Mts., s. Ore., *Henderson;* not A. hendersonii Baker (1879). *A. watsonii* Sheld. Minn. Bot. Stud. 1:23 (1894); not A. watsoniana (Ktze.) Sheld. l.c. 144. *A. pruniformis* Jones, Proc. Cal. Acad. ser. 2, 5:660 (1895), type loc. "Butte Co., Ore.," *R. M. Austin.* *A. cymatodes* Greene, Pitt. 3:196 (1897), type loc. upper Sacramento Valley. *A. accidens* var. *pacificus* Jones, Rev. N. Am. Astrag. 164 (1923). *A. accidens* var. *hendersonii* Jones, Rev. N. Am. Astrag. 164 (1923). *Hesperonix watsonii* Rydb. N. Am. Fl. 24:439 (1929).

30. **A. serenoi** Sheld. Cartridge Loco. (Fig. 210.) Stems freely branching, erect, 1½ to 2 feet high; herbage hoary-pubescent or in age (especially the stems) glabrate and green, or the hoariness persistent on under side of leaflets; leaves 3½ to 4½ inches long, the rachis thick and stem-like, the 2 or 3 pairs of leaflets very remote; leaflets linear, ½ to 1¼ inches long; racemes 6 to 8-flowered, the flowers mostly distant; corolla blue, 6 to 9 lines long; pods ascending or erect, shortly subcylindric, that is very turgid and oblong in outline, beaked, 7 to 9 lines long, 1-celled, or partially or in age completely 2-celled; beak spine-like or subulate, 1½ lines long; fruiting pedicels 1½ lines long.

Cañon bottoms or alkaline flats, 4400 to 7500 feet: White Mts., Inyo Co. North through Nevada from Mineral Co. to the Carson sink and the Humboldt Mts. May, fr. July.

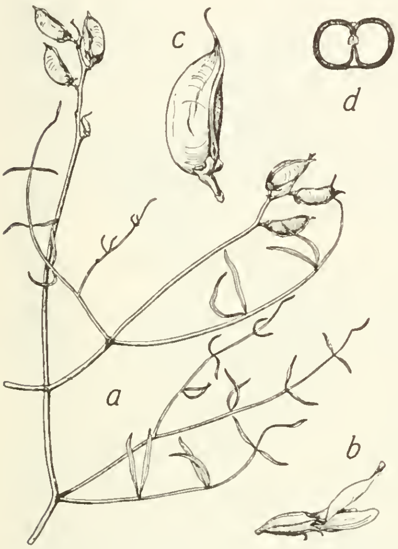

Fig. 210. Astragalus serenoi Sheld. *a*, fr. branch, × ⅓; *b*, fl., × 1; *c*, pod, × 1; *d*, cross sect. of pod, × 1.

Field note.—Distinguished by its peculiar bushy habit and opposite branching and by its fleshy pods, Astragalus serenoi Sheld. is a remarkable species of the western deserts of Nevada which enters California feebly in the region of the White Mts. The few scattered leaflets sometimes tend to be deciduous, so that the stem-like effect of the rachis is markedly heightened.

Locs.—Silver Cañon, White Mts., *Jepson* 7209; Black Cañon, White Mts., *Duran* 2658. Nevada: Candelaria (Jones, Rev. N. Am. Astrag. 150).

Refs.—Astragalus serenoi Sheld. Minn. Bot. Stud. 1:130 (1894). *A. nudus* Wats. Bot. King 74 (1871), type loc. West Humboldt Mts., Nev., *Watson* 280; not A. nudus Clos. (1846). *Tragacantha serenoi* Ktze. Rev. Gen. Pl. 2:941 (1891). *Brachyphragma serenoi* Rydb. Am. Jour. Bot. 16:205 (1929). *A. shockleyi* Jones, Proc. Cal. Acad. ser. 2, 5:659 (1895), type loc. Fish Lake Valley, Esmeralda Co., Nev., *Shockley* 527; Jepson, Man. 569 (1925). *Brachyphragma shockleyi* Rydb. N. Am. Fl. 24:400 (1929). *A. canonis* Jones, Contrib. W. Bot. 8:15 (1898), type loc. Big Indian Cañon, Hawthorne, Nev., *Jones;* pods 12 lines long; beak 2 to 2½ lines long; appears to be a robust form (type in Baker Herb.).

31. **A. pycnostachyus** Gray. Salt Loco. Stems rather stout, 1 to 3 feet high; herbage grayish-pubescent, the hairs tending to be straight and appressed; leaves 2 to 3 inches long; leaflets 23 to 31, narrowly oblong, crowded, ½ to ¾ inch long; peduncles a little shorter than the leaves; spikes oblong or cylindric, very dense, 1 to 2½ inches long; flowers 4 to 5 lines long, shortly piceled or subsessile; calyx-teeth triangular- or ovate-acute or -subulate, ⅔ to 1 line long, ½ to ¾ to as long as the broadly campanulate tube; corolla whitish or yellowish; pods ovate, acute, beaked with the persistent style, 1-celled, glabrous, veined, retrorsely imbricated, 4 to 4½ lines long; seeds few.

Salt marshes or springy spots of cañons or by creeks opening to the sea, 5 to 100 feet: along the coast line from San Mateo Co. to Humboldt Co. July-Aug.

Locs.—Tunitas Creek, San Mateo Co., *Jepson* 4158; San Gregorio, San Mateo Co., *Congdon;* Bolinas Bay, *Greene;* Drake's Bay, *Jepson* 556m; Cape Mendocino, *Jepson* 2143.

Var. **lanosissimus** Munz & McBurney. Herbage silvery-lanate; calyx-teeth shorter, ½ to ¾ line long.—Along the coast: Ventura Co. to Orange Co. July-Oct.

Locs.—Oxnard, *W. S. Cooper* 178; Ballona, *Chandler* 2045; Cienega, Los Angeles, *Geo. B. Grant* 6317.

Refs.—ASTRAGALUS PYCNOSTACHYUS Gray, Proc. Am. Acad. 6:527 (1865), type loc. Bolinas Bay, *Bolander;* Jepson, Fl. W. Mid. Cal. 292 (1901), ed. 2, 236 (1911), Man. 572, fig. 562 (1925). *Tragacantha pycnostachya* Ktze. Rev. Gen. Pl. 2:947 (1891). *Phaca pycnostachya* Rydb. N. Am. Fl. 24:357 (1929). Var. LANOSISSIMUS Munz & McBurney, Bull. S. Cal. Acad. 31:66 (1932). *Phaca lanosissima* Rydb. N. Am. Fl. 24:357 (1929), type loc. La Bolsa, Orange Co., *S. B. & W. F. Parish* 1117.

32. **A. brauntonii** Parish. Granite Loco. Stems erect or reclining, 3 to 4 feet high; herbage gray-tomentulose; leaves 4 to 6 inches long; leaflets 25 to 37, oblong, truncate or obtuse, 3 to 6 lines long; racemes cylindric, densely flowered, 2 to 4½ inches long, the flowers and fruit reflexed, the peduncles shorter than the leaves; calyx-teeth subulate, slightly longer than the tube; corolla light purple, 4 lines long, the banner prominent; pods sessile, oblong, slightly curved, tomentose, grooved dorsally, incompletely 2-celled (the apical portion without partition), 3 to 4 lines long, the lower portion of the style persistent as a beak; seeds 2 or 3 on each side of the partition fold.

Decomposed granite soil, 300 to 2000 feet: foothills and plains along the coast line of the Santa Monica Mts., Los Angeles Co. May, fr. June.

Geog. note.—Astragalus brauntonii Parish, which for so long escaped detection or passed as A. pycnostachyus Gray, is a very narrow endemic with the number of individuals extremely few. It is nearly related to and closely simulates A. pycnostachyus Gray in habit and in shape of the spikes and in reflexing of pods. As pointed out by Ernest Braunton, its discoverer, the stems in A. brauntonii tend to be much the same hue as the rest of the plant, whereas in A. pycnostachyus the stems are greenish in contrast to the tomentulose leaves. Furthermore the stipules in A. brauntonii are commonly triangular-acute, in A. pycnostachyus they are flagellate with a triangular base. The entire length of the style is persistent in the former, only the lower half in the latter. Both A. brauntonii and A. pycnostachyus have subulate calyx-teeth as long as the tube, but on the Los Angeles coast, curiously enough, where the variety of A. pycnostachyus occurs in the neighborhood of the related species, its calyx-teeth are triangular-acute and about ⅓ as long as the tube. In A. brauntonii the cells of the pod split apart at the apex furnishing an orifice for escape of the seeds during the period before the fruit falls. There is no such device in A. pycnostachyus.

Locs.—Cienega, *Geo. B. Grant* 6317a; Sherman, *Braunton* 1281; Malibu, *Barber.*

Refs.—ASTRAGALUS BRAUNTONII Parish, Bull. S. Cal. Acad. 2:26, pl. 1 (1903), type loc. Sherman, *Braunton & Grant;* Jepson, Man. 576 (1925). *Brachyphragma brauntonii* Rydb. N. Am. Fl. 24:399 (1929).

33. **A. bicristatus** Gray. Two-crest Loco. Stems diffusely branched from a suffrutescent base, 12 to 18 inches high; herbage strigulose, the hairs of the inflorescence commonly black; leaves 2¼ to 3½ inches long; leaflets 13 to 19, mostly rather remote, linear, obtuse, 3 to 11 lines long; flowers 6 to 9 lines long, rather numerous in loose racemes; calyx-teeth triangular-subulate, ⅓ to ½ as long as the campanulate tube; corolla yellowish-white, twice as long as calyx, the keel very blunt; pods oblong, strongly obcompressed, prominently 2-keeled, moderately to strongly curved, conspicuously wrinkled or veined, 1-celled, glabrous, 1 to 1¼ inches long, recurved on a stipe 4 to 5 lines long; seeds numerous.

Open desert slopes or cañon floors, 5500 to 7300 feet: San Gabriel and San Bernardino mountains. June-July.

Locs.—Cascade Cañon, Ontario Peak, *Johnston* 2039; Swartout Valley, *Munz* 4593; Prairie Fork, San Gabriel River, *Peirson* 2510; San Antonio Mts., *Hall* 1247; Bear Valley, San Bernardino Mts., *Parish* 3000, *Lemmon;* Holcomb Valley, San Bernardino Mts., *Munz* 10,627.

Refs.—ASTRAGALUS BICRISTATUS Gray, Proc. Am. Acad. 19:75 (1883), type loc. San Bernardino Mts., *S. B. & W. F. Parish;* Jepson, Man. 570 (1925). *Homalobus bicristatus* Rydb. Bull. Torr. Club 51:19 (1924). *A. bicristatus* var. *tetrapteroides* Jones, Contrib. W. Bot. 10:58 (1902), type loc. Bear Valley, San Bernardino Mts., *Jones.*

34. **A. webberi** Gray. JUNE LOCO. (Fig. 211.) Stems several, ascending or erect, arising from a heavy root-crown, 5 to 12 inches high, strigulose; leaves 1¼ to 3 inches long; leaflets 11 to 17, mostly approximate, oblong, tapering from above the middle to the acutish base and to the obtuse apex, silky-pubescent, 5 to 10 lines long, 2 to 3 lines wide; peduncles stout, 2 to 4 inches long; racemes 1 to 2 inches long, 5 to 9-flowered; flowers 6 to 7 lines long; calyx-teeth broadly subulate, about ½ as long as the tube; corolla yellowish; pods obcompressed, oblong in outline, acute, cross-wrinkled, ridged on both sutures, glabrous or nearly so, 9 to 14 lines long, 4 to 5 lines wide.

Valley flats, 3500 to 5000 feet: Plumas and Sierra Cos., in valleys on or near the easterly crests of the Sierra Nevada. May, fr. June.

Note on occurrence.—Astragalus webberi Gray is a localized endemic which has, apparently, been collected only in Indian Valley, Plumas Co., and in Sierra Valley, Sierra Co. It is related on the one hand to A. casei Gray and on the other to A. bicristatus Gray. Its pods are ridged on the two sutures as in A. bicristatus but more narrowly. In A. webberi the dorsal ridge splits into two before dehiscence of the pod, in A. bicristatus only with dehiscence of the pod. The pod of A. webberi is not as strongly obcompressed as in A. bicristatus. In A. casei the leaflets are very much narrower and very much more remote than in A. webberi.

Refs.—ASTRAGALUS WEBBERI Gray; B. & W. Bot. Cal. 1:154 (1876), based on spms. from Indian Valley (s. side), Plumas Co., *Ames,* and Sierra Valley, Sierra Co., *Lemmon. Tragacantha webberi* Ktze. Rev. Gen. Pl. 2:949 (1891). *Xylophacos webberi* Rydb. Bull. Torr. Club 52:151 (1925).

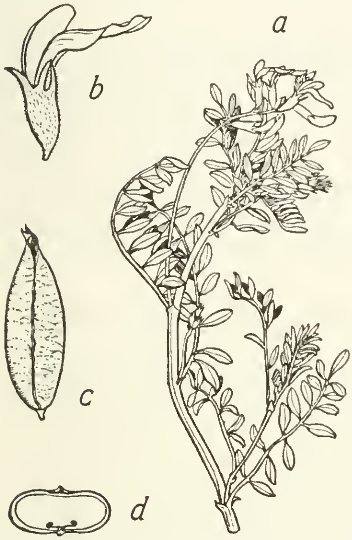

Fig. 211. ASTRAGALUS WEBBERI Gray. *a*, fl. branch, × ½; *b*, fl., × 1½; *c*, pod, × ⅔; *d*, cross sect. of pod, × 1.

35. **A. casei** Gray. OLD PARD LOCO. Stems several from the root-crown, branching, 9 to 11 inches high; herbage green and seemingly glabrous but sparingly strigulose; leaves 2 to 3 inches long; leaflets 11 to 13, distant, linear, 6 to 11 lines long; racemes loose, 1 to 2 inches long; flowers 6 to 7½ lines long; calyx black-strigulose, its teeth about ⅙ as long as the tube; corolla purplish; pods oblong in outline, acute, strongly flattened contrary to the sutures, conspicuously beaked, 1-celled, scantily strigulose, 1 to 1½ inches long, 4 to 5 lines wide; beak stout, acuminate, spine-tipped, inflexed but straight.

Desert hillslopes or dry flats, 5500 to 7000 feet: Death Valley region. North through western Nevada to eastern Washington. May.

Locs.—Nelson Range, *Hall & Chandler* 7154; Willow Creek, Panamint Range, *Coville & Funston* 747; Harrisburg Flats, Panamint Range, *Parish* 9897; Piñon Hill, White Mts., *Duran* 2861. Summit sta., Mineral Co., Nev., *Shockley* 354; Gold Mt., Nev., *Purpus* 5984.

Refs.—ASTRAGALUS CASEI Gray; B. & W. Bot. Cal. 1:154 (1876), type loc. Pyramid Lake, Nev., *Lemmon, Case;* Jepson, Man. 570, fig. 560 (1925). *Tragacantha casei* Ktze. Rev. Gen. Pl. 2:943 (1891). *Xylophacos casei* Rydb. Bull. Torr. Club 52:147 (1925).

36. **A. iodanthus** Wats. WASHOE LOCO. Stems many from the branched root-crown, ascending or procumbent, 6 to 12 inches long; herbage glabrous or essentially so; leaves 1½ to 2½ inches long; leaflets 11 to 15, obovate, obtuse or retuse, 1¾ to 5 lines long; racemes ½ to ¾ inch long; flowers 4 to 5 lines long;

calyx-teeth setaceous, ¾ as long as tube; corolla pale blue; pods narrowly oblong, strongly flattened contrary to the partition, strongly curved or crescent-shaped, dorsally grooved, acuminately beaked, 1-celled, glabrous or scantily puberulent, mottled, ¾ to 1⅛ inches long.

Montane valleys or slopes, 5000 to 6000 feet: valleys east of the Sierra Nevada crest in Sierra Co., rare. East side of the Sierra Nevada from Washoe Co., Nev., to Esmeralda Co., Nev. June (fr.).

Locs.—Sierra Valley (Bot. Cal. 1:154). Nevada: Reno, *Hillman;* Hunter Creek, Washoe Co., *Kennedy* 1600; Miller Mt., Esmeralda Co., *Shockley* 300; Tonopah, *Shockley* 3.

Refs.—ASTRAGALUS IODANTHUS Wats. Bot. King 70 (1871), type loc. Virginia City, Nev., *Bloomer & Torrey;* Jepson, Man. 570 (1925). *Tragacantha iodantha* Ktze. Rev. Gen. Pl. 2:945 (1891). *Xylophacos iodanthus* Rydb. Bull. Torr. Club 52:144 (1925).

37. **A. gibbsii** Kell. Lassen Sickle. Stems rather stout, branching, 1 foot high; herbage with a short spreading pubescence, often grayish; leaves 2½ to 3½ inches long; leaflets 15 to 21, obovate, retuse or obcordate, 3 to 7 lines long; flowers yellowish-white, 6 to 9 lines long, numerous in dense racemes, borne on peduncles exceeding the leaves; calyx-teeth triangular, ⅓ to ¼ the length of the oblong-campanulate tube; pods sub-cylindric, somewhat curved, 1-celled, pubescent or subglabrate, ¾ to 1 inch long, 2 to 3 lines wide, on a stipe 6 to 7 lines long.

Mountain slopes, 4000 to 5000 feet: summits and eastern slopes of the northern Sierra Nevada from Alpine Co. to Lassen Co. Western Nevada to Oregon and Idaho. May-June.

Locs.—Red Clover Creek, Plumas Co., *Hall & Babcock* 4448; Milford, Lassen Co., *T. Brandegee;* Amedee, Lassen Co., *Jones.* Nevada: Reno, *Hillman;* Kings Cañon, Ormsby Co., *C. F. Baker* 1035.

Var. **falciformis** Jones. Plants taller; pubescence shorter; pods 1¾ to 2 lines wide, strongly curved, forming a ½ to ⅔ or even complete circle, glabrous or nearly so, the valves often conspicuously veiny.—Northeastern California, from Lassen Co. to Modoc Co. and Siskiyou Co.: Honey Lake, *T. Brandegee;* Fall River Mills, Shasta Co., *Hall & Babcock* 4252; Forestdale, sw. Modoc Co., *M. S. Baker;* Ager, Siskiyou Co., *K. Brandegee.* North to Oregon.

Refs.—ASTRAGALUS GIBBSII Kell. Proc. Cal. Acad. 2:161 (1862), type loc. near headwaters of Carson River, Alpine Co., *Gibbs;* Jepson, Man. 571 (1925). *Tragacantha gibbsii* Ktze. Rev. Gen. Pl. 2:945 (1891). *Homalobus gibbsii* Rydb. Bull. Torr. Club 51:15 (1924). *Astragalus cyrtoides* Gray, Proc. Am. Acad. 6:201 (1864), type loc. Clear Water River, Wash., *Spalding. Homalobus plummerae* Rydb. Bull. Torr. Club 51:16 (1924), type loc. Sierra Co., probably Sierra Valley, *Lemmon;* this is clearly a synonym as evidenced by the type spm. (N. Y. Bot. Gard.). Var. FALCIFORMIS Jones, Contrib. W. Bot. 8:23 (1898). *A. speirocarpus* Gray var. *falciformis* Gray; B. & W. Bot. Cal. 1:152 (1880), type loc. Sierra Co., *Lemmon. A. speirocarpus* var. *curvicarpus* Sheld. Minn. Bot. Stud. 1:125 (1894). *A. gibbsii* var. *curvicarpus* Jones, Contrib. W. Bot. 10:62 (1902). *A. whitedii* Piper, Bull. Torr. Club 29:224 (1902), type loc. Colockum Creek, se. of Wenatchee, Wash., *K. Whited* 1353. *A. curvicarpus* Mcbr. Contrib. Gray Herb. 65:38 (1922). *Homalobus curvicarpus* Hel. Muhl. 2:86 (1905). *H. whitedii* Rydb. Bull. Torr. Club 51:16 (1924).

38. **A. collinus** Dougl. var. **californicus** Gray. Shasta Loco. Stems commonly several from a stout woody base, ¾ to 2 feet high; herbage pubescent, becoming glabrate; leaves 1 to 2½ inches long; leaflets 13 to 19, oblong, emarginate, sometimes merely obtuse, acute at base, 3 to 7 lines long; racemes short, the peduncles surpassing the leaves; flowers yellowish, 5 to 6 lines long; calyx-teeth triangular-subulate, ¼ to ⅓ as long as the tube; pods linear, sub-cylindric, straight, 11 to 18 lines long, 1-celled, glabrous or puberulent, often purplish-mottled, spreading horizontally, tapering to a stipe 3 to 9 lines long.

Montane, 1000 to 2700 feet: valleys and cañons about Mt. Shasta, Siskiyou and Shasta Cos. May-June.

Locs.—Hornbrook, *Howell;* Humbug Mt., Siskiyou Co., *Butler* 593, 1284 (pods veined, puberulent); Cherry Creek, Siskiyou Co., *Butler* 393; betw. Igerna and Weed, Siskiyou Co., *Heller* 8082 (pods not veined, puberulent); Gregory, upper Sacramento River, Shasta Co., *Hall & Babcock* 4016 (pods veined, glabrous).

Refs.—ASTRAGALUS COLLINUS Dougl.; Hook. Fl. Bor. Am. 1:141 (1831), type loc. Blue Mts., Ore., *Douglas.* Var. CALIFORNICUS Gray, Proc. Am. Acad. 12:54 (1878), type loc. Yreka, *Greene. A. californicus* Greene, Bull. Cal. Acad. 1:157 (1885); Jepson, Man. 571 (1925). *Homalobus californicus* Hel. Muhl. 2:86 (1905).

39. **A. filipes** Torr. GRANNY LOCO. Stems slender, many from base, closely erect, 1 to 2 feet high; herbage glabrous or sparingly strigose-pubescent; leaves 2 to 3½ inches long; leaflets 9 to 17, rather distant, narrowly linear, ¼ to ¾ inch long; racemes long-peduncled, loosely flowered; calyx-teeth broad, about ¼ as long as the campanulate tube; corolla yellowish-white, 4 to 5 lines long; pods spreading or pendulous, linear-oblong, acute, compressed, 1-celled, glabrous, ½ to 1 inch long, 2 to 2¼ lines wide, rather shortly tapering at base into a stipe 3 to 4 lines long.

Plains and mountain valleys, 2000 to 5500 feet: Lassen and Modoc Cos. to Siskiyou Co. North to Washington. June.

Geog. note.—Astragalus filipes has its chief development in Washington and Oregon, and as to the typical form enters California only along our northern borders. Through its variety residuus Jepson it is very closely allied to A. antisellii Gray and we are unable to indicate a satisfactory cleavage point in the series constituted by A. filipes and A. antisellii and their varieties.

Locs.—Shasta Valley plain, *K. Brandegee;* Modoc Co., *M. S. Baker;* Milford, Lassen Co., *T. Brandegee;* Big Valley, Lassen Co., *Baker & Nutting;* Goose Lake, Modoc Co., *Austin & Bruce;* Deep Creek, Warner Mts., *L. S. Smith* 1126.

Var. **residuus** Jepson. Ventral margin of pods straight or straightish, the dorsal margin slightly curved.—Valleys and mountain slopes near the desert from the Santa Rosa Mts. to Mt. Pinos.

Locs.—Cahuilla Valley, Riverside Co., *Jepson* 1469; Thomas Valley, San Jacinto Mts., *Jepson* 1327; San Bernardino Mts., *Parish* 1281; Mt. Pinos, *Hall* 6422.

Refs.—ASTRAGALUS FILIPES Torr.; Gray, Proc. Am. Acad. 6:226 (1864), type loc. Ft. Okanagan, Wash., *Pickering;* Jepson, Man. 571 (1925). *Tragacantha filipes* Ktze. Rev. Gen. Pl. 2:944 (1891). *Homalobus filipes* Hel. Muhl. 9:67 (1913). Var. RESIDUUS Jepson, Man. l.c., type loc. Cahuilla Valley, *Jepson* 1469.

40. **A. inversus** Jones. LAVA LOCO. Stems flexuous, straggling, 1½ to 2 feet long; herbage very sparsely strigose; leaflets 7 to 11, linear to filiform, 4 to 6 lines long; flowers 4½ lines long; calyx-teeth triangular; corolla pinkish; pods linear, acute or acuminate, spreading or recurved, straight or slightly curved, a little thickened, appressed-puberulent, often mottled, 1¼ to 1⅜ lines long, 1½ to 2½ lines wide; beak ½ to 2 lines long; stipe 2½ to 6 lines long.

Lava beds, 4000 to 4400 feet: Shasta, Lassen and Modoc Cos. May-June.

Note on occurrence.—Astragalus inversus Jones is a rare endemic of the lava bed region of northeastern California. Further exploration and field investigation may reveal more of it and the nature of its relationship to A. filipes, which is very close. The leaflets in A. inversus are fewer and often narrower and the racemes are more lax than in A. filipes.

Locs.—Modoc Co., *M. S. Baker;* Susanville, *Jones;* ne. Shasta Co., *Hall & Babcock* 4239.

Refs.—ASTRAGALUS INVERSUS Jones, Zoe 4:276 (1893), type loc. Susanville, *T. Brandegee. Homalobus inversus* Rydb. Bull. Torr. Club 50:271 (1923). *A. filipes* var. *inversus* Jepson, Man. 571 (1925).

41. **A. antisellii** Gray. DOCTORS LOCO. Stems several from the root-crown, erect or ascending, 1¼ to 3 feet high; herbage strigulose; leaves 2 to 6½ inches long; leaflets 23 to 27, oblong to linear, notched at apex or sometimes obtuse, 4 to 10 lines long; racemes dense, 2 to 3 inches long; peduncles longer, commonly much longer than the leaves; flowers 5 to 7 lines long, soon spreading or reflexed; calyx-teeth often black-hairy, ⅓ as long as the campanulate tube; corolla white; pods spreading or declined, flat, oblanceolate to oblong-oblanceolate, equilateral, abruptly acute, glabrous or minutely and scantily strigulose, 10 to 13 lines long, 2 to 3 lines wide.

Open hillslopes, 1500 to 3700 feet: inner ranges back of the coast from San Luis Obispo Co. to Los Angeles Co. Apr.-May (fl. and fr.).

Field note.—This narrow range species probably has its center of distribution and greatest development in the mountains between Tejon Pass and the upper Santa Clara River. The numerous stems from the root-crown, partly erect and partly spreading, branch low, thus forming dense clumps 10 to 18 inches high and 2 to 4 feet broad.

Locs.—Betw. Pine Creek bridge and Cuyama Valley, s. San Luis Obispo Co., *Jepson* 12,157; Lebec, near Tejon Pass, *Jepson* 12,423; San Francisquito Cañon, Los Angeles Co., *Parish* 1886; Castaic (mts. nw. of), Los Angeles Co., *Jepson* 12,425; Tujunga, San Gabriel Mts., *Peirson* 2099.

Refs.—ASTRAGALUS ANTISELLII Gray; B. & W. Bot. Cal. 1:152 (1876). *Homalobus multiflorus* Torr. Pac. R. Rep. 7^3:10 (1856), Santa Inez, *Antisell;* not H. multiflorus T. & G. (1838). *Homalobus antisellii* Rydb. Bull. Torr. Club 50:271 (1923). *A. trichopodus* var. *antisellii* Jepson, Man. 572, fig. 561 (1925). *H. macgregori* Rydb. Bull. Torr. Club 50:270 (1923), type loc. near Frazier Borax Mine, Mt. Pinos, Ventura Co., *Abrams & McGregor* 219; a synonym as evidenced by the type specimen (N. Y. Bot. Gard.); Rydberg says "pods linear-elliptic", but they do not differ from the usual or prevailing form.

42. **A. trichopodus** Gray. COAST LOCO. Stems rigid, erect, 1 to 3 feet high; herbage thinly strigose-puberulent or the upper surface of the leaves glabrous; leaves 3 to 5½ inches long; leaflets numerous, narrowly oblong or cuneate-oblong, obtuse to retuse, 3 to 6 (or 7) lines long; racemes short, commonly dense, the peduncles commonly shorter than the leaves; pedicels recurved in fruit; flowers 4 to 6 lines long; calyx-teeth triangular-subulate, ⅓ as long as the campanulate tube; corolla yellowish-white; pods compressed or somewhat inflated, mostly semi-elliptic with the ventral suture nearly straight or a little convex, acute at base and apex, 1-celled, glabrous, 6 to 11 lines long, 3 to 4½ lines broad, pendulous on a filiform minutely pubescent stipe 3 to 6 lines long.

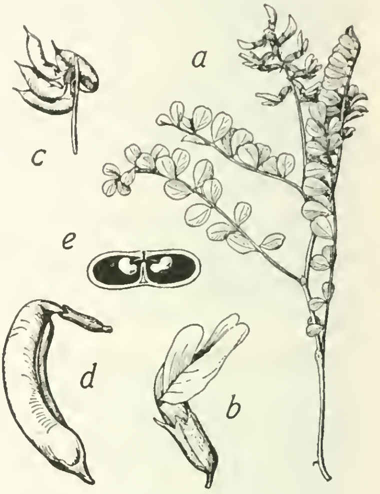

Fig. 212. ASTRAGALUS CIMAE Jones. *a*, fl. branch, × ⅓; *b*, fl., × 1½; *c*, cluster of pods × ⅓; *d*, pod, × 1; *c*, cross sect. of pod, × 1½.

Cañons or mesas in the immediate coastal region, 50 to 1000 feet: Santa Barbara Co. to Orange Co. May-July.

Variation.—The pods differ much in size, varying in various collections from ½ to 1⅙ inches long. There is also some variation in shape: 1. Pods with the ventral margin straight or only slightly curved, the dorsal suture strongly curved (Santa Catalina Isl., *Trask;* Santa Ana Cañon, Orange Co., *J. T. Howell* 2415; Gaviota, Santa Barbara Co., *Eastwood*). 2. Dorsal margin less markedly curved (La Brea Cañon, Puente Hills, *T. W. Minthorn*). 3. Ventral margin with a long low curve, the dorsal margin rather strongly curved, the pods short, 5 to 7 lines long (Santa Barbara, *Eastwood*).

Refs.—ASTRAGALUS TRICHOPODUS Gray, Proc. Am. Acad. 6:218 (1864); Jepson, Man. 571 (1925). *Phaca trichopoda* Nutt.; T. & G. Fl. 1:343 (1838), type loc. Santa Barbara, *Nuttall. Tragacantha trichopoda* Ktze. Rev. Gen. Pl. 2:948 (1891). *A. capillipes* Jones, Rev. N. Am. Astrag. 117 (1923), type loc. Santa Catalina Isl., *Trask. Phaca capillipes* Rydb. N. Am. Fl. 24:336 (1929). *A. trichopodus* var. *capillipes* Munz & McBurney, Bull. S. Cal. Acad. 31:67 (1932). *A. gaviotus* Elmer, Bot. Gaz. 39:54 (1905), type loc. Gaviota, Santa Barbara Co., *Elmer* 3759. *Homalobus gaviotus* Rydb. Bull. Torr. Club 50:272 (1923). *A. trichopodus* var. *gaviotus* Jepson, Man. 571 (1925). *A. antisellii* var. *phoxus* Jones, Contrib. W. Bot. 10:65 (1902), type loc. not stated.

A. hasseanus Sheld. Minn. Bot. Stud. 1:124 (1894), type loc. San Buenaventura (present day Ventura), *Hasse;* this binomial is unquestionably a synonym of A. trichopodus Gray as evidenced by the type specimen (Univ. of Minn. Herb.) and not the equivalent of A. antisellii Gray as said by Rydberg (N. Am. Fl. 24:274), a species which belongs in a different climatic region.

43. **A. cimae** Jones. CIMA LOCO. (Fig. 212.) Stems several from the root-crown, branching, diffuse, 10 to 12 inches high; herbage glabrous; leaves 2 to 5½ inches long; leaflets 11 to 19, broadly ovate or suborbicular, obtuse, 7 to 10 lines

long, petiolulate; petioles ½ to 9 lines long; peduncles stout, 1¼ to 2½ inches long; flowers 6 lines long; calyx-teeth narrowly lanceolate, ⅓ as long as tube; corolla dull purplish and greenish white; pods oblong in outline, strongly obcompressed, broadly and shallowly grooved dorsally, markedly curved, glabrous, 10 to 11 lines long, incompletely 2-celled by intrusion of the dorsal suture; stipe 3 to 4 lines long.

Sandy mesas, 4000 to 4500 feet: region of the Providence Mts., Mohave Desert. Fr. June.

Tax. note.—This excellent species, first recognized by Jones, has been collected only twice: Barnwell, *Ferris & Bacigalupi;* Cima. It is placed near Astragalus bolanderi Gray by Jones (Rev. N. Am. Astrag. 163), to which it is not at all related. Its pods are those of Astragalus leucolobus Jones in shape, curvation, and obcompression. The dorsal suture is similarly intruded, though not so completely.

Refs.—ASTRAGALUS CIMAE Jones, Rev. N. Am. Astrag. 163 (1923), type loc. Cima (e. Mohave Desert), *K. Brandegee. Phacomene cimae* Rydb. N. Am. Fl. 24:384 (1929).

44. **A. layneae** Greene. WIDOW'S LOCO. Stems commonly very short, diffusely spreading, ½ to 1½ feet high, the leaves mostly basal or sub-basal; herbage densely appressed-villous or often loosely villous, gray or at length subglabrate and greenish; leaves 3 to 6 inches long; leaflets 13 to 23, roundish-obovate, obtuse, 3 to 9 lines long; racemes loose, 2 to 8 inches long, many-flowered, the peduncles longer or shorter than the leaves; flowers 6 to 10 lines long; calyx black-hairy; calyx-teeth triangular, ¼ to ⅓ as long as the tube; corolla white, purple-tipped; free filament very short; pods linear, acute or acuminate, obcompressed, strongly incurved, hairy-pubescent or glabrate, often purplish-mottled, 1 to 2 (or 2½) inches long, 2¾ to 5 lines wide, incompletely 2-celled, the inturning of the dorsal suture forming a broadly V-shaped groove; seeds 10 to 20.

Sandy washes in the desert, 2200 to 5100 feet: Mohave Desert; Inyo Co. East to Arizona and Nevada. Apr.-May, fr. May-June.

Locs.—Stoddard Well, *Jepson* 5903; Kramer, *Jepson* 5335; Calico Wash, n. of Daggett, *Jepson* 6698; Inyo, *T. Brandegee;* Searles sta., Inyo Co., *Wheeler & Richardson;* Maturango Peak, Argus Mts., *R. S. Ferris* 7843; Harrisburg Flat, Panamint Range, *Parish* 9998; Echo Cañon, Funeral Mts., *Coville & Gilman* 128; Darwin, Inyo Co., *Jones.*

Refs.—ASTRAGALUS LAYNEAE Greene, Bull. Cal. Acad. 1:156 (1885), type loc. Mohave Desert, *Parish Bros.* 1273; Jepson, Man. 573, fig. 565 (1925). *A. malacus* var. *layneae* Jones, Zoe 4:29 (1893). *Hamosa layneae* Rydb. Bull. Torr. Club 54:15 (1927). *A. fremontii* var. Gray; Torr. Pac. R. Rep. 4:80 (1857).

45. **A. nevinii** Gray. DUNE LOCO. Stems ascending, 8 to 18 inches long; herbage silvery-pubescent; leaves 1½ to 3 inches long; leaflets barely discrete, cuneate-obovate, notched at apex or obtuse, 2 to 8 lines long; racemes several-flowered, subcapitate, ¾ to 1½ inches long; flowers 5 to 5½ lines long; calyx-teeth lanceolate, a little over half the length of the tube; corolla white; pod 2-celled, rather narrowly oblong, curved, somewhat obcompressed, strongly grooved dorsally, reticulate, puberulent to tomentulose, glabrate, stipitate, 8 lines long, 2 to 2½ lines wide.

Sand dunes, 50 to 200 feet: Santa Barbara Isls. Aug. (fl. and fr.).

Locs.—San Clemente Isl., *T. Brandegee;* Santa Catalina Isl. (Dav. & Mox. Fl. S. Cal. 195); Santa Barbara Isl., *Trask;* Anacapa Isl., *Hemphill.*

Refs.—ASTRAGALUS NEVINII Gray, Proc. Am. Acad. 21:412 (1886), type loc. San Clemente Isl., *Nevin & Lyon;* Jepson, Man. 575 (1925). *Tium nevinii* Rydb. N. Am. Fl. 24:390 (1929). *A. traskiae* Eastw. Proc. Cal. Acad. ser. 3, 1:102, fig. 6 a-d (1898), type loc. San Nicolas Isl., *Trask. Tium traskiae* Rydb. N. Am. Fl. 24:390 (1929).

46. **A. inyoensis** Sheld. INYO LOCO. Stems slender, prostrate or widely spreading, several from a branched root-crown, 8 to 18 inches long; stems subglabrous; leaves grayish-strigulose, the upper surface of leaflets glabrous; leaves remote or somewhat scattered, ¾ to 1½ inches long; stipules reflexed; petioles 1 to 4 lines long; leaflets 17 to 21, approximate, oval to broadly oblong or obovate, 2 to

4 lines long; racemes lax, 5 to 13-flowered, ½ to 5 inches long; peduncles 5 lines to 2¾ inches long; flowers 3 to 4 lines long; calyx gray-strigulose, the teeth broadly lanceolate to subulate, ½ to ¾ line long, about ½ as long as the tube; corolla lavender to purple; pods oblong, acute, curved, cross-wrinkled, obcompressed, 4 to 5 lines long, 2 lines wide, tipped by a spine-like beak 1 line long, at base more or less attenuate into a stipe 1¾ to 2 lines long; dorsal suture intruded on proximal half or third, the pods thus incompletely 2-celled.

Dry flats and slopes, sagebrush association, 6000 to 7300 feet: eastern Inyo Co. May–June.

Note on occurrence and structure.—Aside from the type collection, we have seen only three other collections: Cedar Flat, White Mts., *Duran* 3283; Westgard Pass, *Duran* 2796 (herbage less pubescent than in the type, the racemes shorter and few-flowered, the peduncles much shorter, 5 to 11 lines long, and the pods more mature and exhibiting a somewhat cord-like ventral suture); Lee District, Nelson Range, *Hall & Chandler* 7162.

Refs.—ASTRAGALUS INYOENSIS Sheld.; Cov. Contrib. U. S. Nat. Herb. 4:86 (1893), type loc. Darwin Mesa, near Mill Creek divide, Inyo Co., *Coville* 791; Jones, Rev. N. Am. Astrag. 263 (1923). *Tium inyoense* Rydb. N. Am. Fl. 24:389 (1929).

47. **A. tricarinatus** Gray. SHUTTLE LOCO. Stems erect, ½ to 1½ feet high, branching from base; herbage canescent; leaves 1½ to 3½ inches long; leaflets 11 to 17, discrete or commonly remote, linear to narrowly oblong, mostly truncatish or notched at apex, 3 to 8 lines long; peduncles longer than the leaves, bearing a loose raceme ¾ to 3½ inches long; flowers 3 to 5½ lines long; calyx-teeth subulate, about as long as the broadly campanulate tube; corolla whitish or yellowish; pods glabrous, strongly grooved on the back so as to appear triquetrous, or becoming convex dorsally, straight or slightly curved, 9 to 17 lines long, almost completely 2-celled, stipitate, the stipe shorter than the calyx, jointed; seeds 8 or 10.

Sandy flats or dry rocky slopes in the mountains, 2000 to 4900 feet: desert side of the San Bernardino Mts.; Conchilla Range; New York Mts. Apr., fr. May.

Locs.—Astragalus tricarinatus is a species remarkable for its glabrous three-sided pods, something like a Y in cross-section. The pods thus have two flat sides (next the ventral suture) and a third or grooved side (opposite the ventral suture). When, however, the fruit ripens into the extreme stage preparatory to dehiscence, the outward pressure of the valves causes the "groove" to disappear and the third side of the pod usually becomes plane or even a little convex. The species appears to be rare. In any event only a few stations validated by fruiting specimens are known: Quail Sprs., Conchilla Range, *Munz* 5220; Whitewater, e. end San Bernardino Mts., *Clary* 19; Shays Well, w. of Warrens Well, *Jepson* 5960; Cushenbury Sprs., *Parish* 2531; Barnwell, New York Mts., *K. Brandegee*. Specimens resembling this species, in flower only, have been collected in Coyote Cañon (southwest side of the Santa Rosa Mts., Riverside Co.), at Banning and in San Emigdio Cañon, all with flowers 6 to 7 lines long.

Refs.—ASTRAGALUS TRICARINATUS Gray, Proc. Am. Acad. 12:56 (1876), type loc. Whitewater, Riverside Co., *Parry*; Jepson, Man. 574 (1925). *Hamosa tricarinata* Rydb. Bull. Torr. Club 54:20 (1927). *A. bernardinus* Jones, Proc. Cal. Acad. ser. 2, 5:661 (1895), type loc. Morongo King Mine, e. end San Bernardino Mts., *Parish*; a synonym as evidenced by the type spm. (U. S. Nat. Herb.). *Hamosa bernardina* Rydb. Bull. Torr. Club 54:19 (1927).

48. **A. umbraticus** Sheld. WOOD LOCO. Stems clustered, ascending, ¾ to 1¼ feet high; herbage glabrous or nearly so; leaves 2½ to 4¾ inches long; leaflets 13 to 23, elliptic to oblong, distinctly emarginate, 4 to 8 lines long; racemes short, densely flowered, the flowers and fruit reflexed, the peduncles equaling or exceeding the leaves; flowers 3½ lines long; calyx slightly pubescent, its teeth slender-acuminate, about equaling the tube; corolla yellowish-white; pods spreading or declined, linear, compressed, curved, grooved dorsally, incompletely 2-celled, glabrous, ¾ to 1 inch long, stipitate; stipe about 1 line long; seeds 6 or 8.

Openly wooded slopes, 2000 to 3000 feet: northern Humboldt Co. North to southern Oregon. June.

Locs.—Betw. Three Creeks and Redwood Creek, *Rattan*; Bald Hills near Hupa, *Manning* 306. Ore.: Glendale, *Henderson* 1342.

Refs.—ASTRAGALUS UMBRATICUS Sheld. Minn. Bot. Stud. 1:23 (1894). *A. sylvaticus* Wats. Proc. Am. Acad. 23:262 (1888), type loc. Glendale, s. Ore., *Henderson, Howell;* Jepson, Man. 525 (1925); not A. sylvaticus Willd. (1803). *Hamosa umbratica* Rydb. Bull. Torr. Club 54:19 (1927).

49. **A. panamintensis** Sheld. PANAMINT LOCO. Stems short and shortly branched, these and the slender curving leaves densely tufted on the branched root-crown, 2 to 4 inches high; herbage canescent, especially the stems; leaves 2½ to 3½ inches long, the petiole and rachis filiform; petioles 2 to 3 inches long; rachis ½ to 1 inch long; leaflets 5 to 11, narrowly linear or narrowly lanceolate, acute or acuminate, 2 to 3½ lines long; stipules distinct, triangular; racemes 2 or 3-flowered, on slender peduncles shorter than or scarcely exceeding the leaves; flowers 5½ to 6 lines long; calyx-teeth subulate, about as long as the tube; corolla yellowish, tipped with purple; pods linear, straight, strigulose, mottled, deeply grooved dorsally, incompletely 2-celled, 5 to 6 lines long, 1⅔ lines wide, shortly stipitate.

Desert cañons, 4500 to 5500 feet: Panamint Range. Apr.

Note on habit.—This plant with its short branches and crowded leaves makes a very dense tuft. The leaflets are small and few, often early deciduous, so that the petiole and rachis in age are represented by a flagellate structure which is very slender and curving. It is mainly the many congested stems and the foliage that endow this herb with an aspect which is different from that of any other of our Astragali. We have seen no specimens save those of Coville & Funston 606 from Surprise Cañon and of Jones from Panamint Cañon. It is, as thus far known, one of the rarest of Astragalus species in western North America.

Refs.—ASTRAGALUS PANAMINTENSIS Sheld.; Cov. Contrib. U. S. Nat. Herb. 4:87 (1893), type loc. Surprise Cañon, Panamint Range, *Coville & Funston* 606. *Tium panamintense* Rydb. N. Am. Fl. 24:396 (1929). *A. atratus* var. *panamintensis* Jepson, Man. 575 (1925).

ASTRAGALUS ORCUTTIANUS Jones, Contrib. W. Bot. 10:63 (1902), type loc. "San Gregorio, Colorado Desert, California". San Gregorio is in Lower California.

50. **A. calycosus** Torr. JOHNNY LOCO. Stems densely tufted on a branched root-crown, 1 to 3 inches high, the leaves and peduncles basal; herbage densely silvery-silky; leaves 1 to 3 inches long; leaflets 3 to 5 (rarely to 11), obovate or oblanceolate to oblong, 2 to 4 lines long; racemes 2 to 6 (or 8)-flowered, 3 to 9 lines long, on peduncles shorter than or rarely exceeding the leaves; flowers 4 to 5 lines long; calyx-teeth subulate, ½ as long as the campanulate tube; corolla-wings whitish, bilobed; banner purple; pods erect or ascending, oblong, straight or slightly curved, finely but densely strigose, 5 to 7 lines long, 1¾ to 2 lines wide, deeply grooved dorsally and thus incompletely 2-celled; seeds about 10.

High montane, on dry slopes, 7000 to 11,000 feet: White Mts.; Inyo and Panamint ranges. North and east through the desert ranges of Nevada, Utah and Arizona. June (fl. and fr.).

Locs.—Gray-haired Johnny's Corral, White Mts., *Duran* 1599; Inyo Range (Contrib. U. S. Nat. Herb. 4:86); Telescope Peak, Panamint Range, *Jepson* 7007. Deep Creek, Nev., *Jones;* Peach Sprs., Ariz., *Lemmon;* Jugtown, Utah, *Jones* 5403.

Var. **scaposus** Jones. Plants 5 to 8 inches high; peduncles 3 to 5 inches long, much exceeding the leaves; leaflets 7 to 11; calyx-teeth deltoid-subulate, about ⅓ as long as the tube.—Montane: Colorado River region from southwestern Colorado to northern Arizona. Owens Valley acc. Jones, Rev. N. Am. Astrag. 258, but doubtful.

Refs.—ASTRAGALUS CALYCOSUS Torr.; Wats. Bot. King 66, pl. 10, figs. 4–7 (1871), West Humboldt, East Humboldt and Clover Mts., Nev., *Watson* 257; Jepson, Man. 575 (1925). *Tragacantha calycosa* Ktze. Rev. Gen. Pl. 2:943 (1891). *Hamosa calycosa* Rydb. Bull. Torr. Club 40:50 (1913). Var. SCAPOSUS Jones, Zoe 4:26 (1893). *A. scaposus* Gray, Proc. Am. Acad. 13:366 (1878), type loc. Mokiah Pass, ne. Ariz., *Palmer. A. candicans* Greene, Bull. Cal. Acad. 1:156 (1885), type loc. n. Ariz., *Rusby;* not A. candicans Pall. (1800). *Hamosa scaposa* Rydb. Bull. Torr. Club 32:659 (1905).

51. **A. obscurus** Wats. BROOM LOCO. (Fig. 213.) Stems wiry or slender, numerous in a broom-like tuft on a branched root-crown, 3 to 8 inches high; herbage appressed-pubescent; leaves 1¼ to 3 inches long; leaflets rather distant, 5 to 13, linear to oblong, 2 to 5 lines long; peduncles conspicuously longer, sometimes

shorter than the leaves; racemes loosely 3 to 6-flowered, ½ inch long; flowers 4 lines long; calyx-teeth subulate, more than half as long as the campanulate tube; corolla yellowish; pods rather strictly erect, linear, straight, subcylindric, coriaceous, lightly strigose-pubescent, 6 to 9 lines long, incompletely 2-celled, the dorsal suture intruded; seeds 6 to 8.

Desert valleys, 4000 to 5500 feet: Lassen Co.; Modoc Co. East to Nevada, north to Oregon and Idaho. June (fl. and fr.).

Locs.—Dixey Mts., Lassen Co., *Baker & Nutting*. Nev.: Reno, *Kennedy*. Ore.: Malheur City, Baker Co., *Cusick* 2368. The following plants are low and tufted (4 to 5 inches high); leaflets fewer and reduced (2 to 3 lines long); peduncles mostly subscapose, 1 to 4½ inches long, little exceeding the leaves: Ewing Creek, ne. Modoc Co., *R. M. Austin*; Goose Lake, Modoc Co., *R. M. Austin*.

Refs.—ASTRAGALUS OBSCURUS Wats. Bot. King 69 (1871), type loc. Truckee Pass, Virginia Mts., Nev., *Watson* 266; Jepson, Man. 574 (1925). *Tragacantha obscura* Ktze. Rev. Gen. Pl. 2:946 (1891). *Tium obscurum* Rydb. Fl. Rocky Mts. 498 (1917).

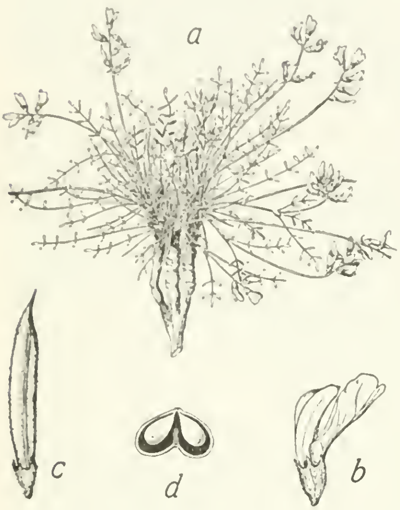

Fig. 213. ASTRAGALUS OBSCURUS Wats. *a*, habit, × ⅓; *b*, fl., × 2; *c*, pod, × 1; *d*, cross sect. of pod, × 3.

52. **A. clevelandii** Greene. CAÑON LOCO. Stems stoutish, erect, branching, 1 to 2½ feet high; herbage puberulent, becoming glabrate; leaves 2 to 3 inches long; leaflets 15 to 23, narrowly oblong to lanceolate, 2½ to 7 lines long; racemes narrow, 3 to 6 inches long, 5 lines wide, on peduncles longer than the leaves; flowers 2 to 2½ lines long; calyx-teeth subulate, about equaling the tube; corolla white or cream-color, hardly over 2 lines long; pods curved, ovate-lanceolate, strongly grooved on the back, reticulate, glabrous, incompletely 2-celled, 2 to 2½ lines long, on recurved pedicels.

Mountain valleys and cañons, 1500 to 3000 feet: northern Napa Co. and eastern Lake Co. July, fr. Aug.

Locs.—Mt. St. Helena (n. side), *Greene*; Butts Cañon, n. Napa Co., *Jepson* 13,743; Knoxville, ne. Napa Co., *Jepson*; Mt. Hannah, Lake Co., *Tracy* 2248.

Refs.—ASTRAGALUS CLEVELANDII Greene, Bull. Torr. Club 9:121 (1882), type loc. Indian Valley, Lake Co., *Cleveland*; Jepson, Fl. W. Mid. Cal. 292 (1901), ed. 2, 236 (1911), Man. 576, fig. 566 (1925). *Hamosa clevelandii* Rydb. Bull. Torr. Club 54:334 (1927).

53. **A. lemmonii** Gray. Stems slender, several to many from the root-crown, ½ to 2 feet long, soon procumbent; herbage strigulose; leaves ¾ to 1¼ inches long; leaflets 9 to 13, linear to linear-oblong, 3 to 5 lines long; peduncles filiform, shorter than the leaves; flowers 1½ to 2 lines long, few to many, crowded in capitate racemes; calyx-teeth setaceous-subulate, equaling or longer than the short-campanulate tube; corolla whitish, tinged with purple; pods puberulent, ovate-oblong, acute, thickened, grooved dorsally, incompletely 2-celled, 2 to 2½ lines long; seeds few.

Valley flats, 5000 to 6700 feet: east side of the Sierra Nevada crest from Mono Co. to Sierra Co. North to eastern Oregon. June (fl. and fr.).

Locs.—Hilton Creek, Owens River, *Peirson* 10,744; Sierra Valley.

Refs.—ASTRAGALUS LEMMONII Gray, Proc. Am. Acad. 8:626 (1873), type loc. Sierra Valley, *Lemmon*; Jepson, Man. 575 (1925). *Tragacantha lemmonii* Ktze. Rev. Gen. Pl. 2:946 (1891).

54. **A. lentiformis** Gray. LENTIL LOCO. Stems tufted on the branched root-crown, 3 to 5 inches long; herbage canescent; leaves 7 to 12 lines long, the petioles nearly equaling the blades; leaflets discrete or a little crowded, linear to oblong or obovate, ¾ to 2½ lines long; racemes 6 lines long, few-flowered; flowers 2¼ lines

long; calyx-teeth slender, nearly as long as the campanulate tube; corolla yellowish; pods elliptic-oblong, obtuse, somewhat compressed, pubescent, 2-celled, 2¾ lines long, the dorsal suture shallow.

Valleys, 4800 to 5100 feet: eastern crests of the northern Sierra Nevada in southeastern Plumas Co. Crook Co., eastern Oregon. June (fl. and fr.).

So far as appears from collections this is one of the rarest of Californian Astragali. Lemmon writes on an herbarium label: "Clover Valley, near Sierra Valley", which would doubtless make the type locality Red Clover Valley, southeastern Plumas Co.

Refs.—ASTRAGALUS LENTIFORMIS Gray; B. & W. Bot. Cal. 1:156 (1876), type loc. "Clover Valley," Sierra Nevada, *Lemmon*. *Tragacantha lentiformis* Ktze. Rev. Gen. Pl. 2:946 (1891).

55. **A. austinae** Gray. SILVER LOCO. Stems densely tufted, 2 to 4 inches long, from a branched root-crown; herbage silvery-pubescent; stipules scarious, mostly united into one ovate body opposite the leaf; leaves 1 to 1¼ inches long; leaflets 9 to 17, rather crowded, oblong or ovate-lanceolate, 2 to 4 lines long; peduncles equaling or exceeding the leaves, bearing 10 to 12 nearly sessile flowers in a dense head; calyx-teeth filiform, longer than the campanulate tube; corolla whitish, 3 to 4 lines long, persistent, with villous wings and banner; pods sessile, densely pubescent, somewhat obcompressed, grooved dorsally, incompletely 2-celled, 2½ to 3 lines long (not equaling the calyx and corolla); seeds few.

Sandy stony soil on dry exposed ridges, 8000 to 11,000 feet: eastern crests of the northern Sierra Nevada from Placer Co. to Nevada Co. East to Nevada. July.

Locs.—Tinker's Knob, Placer Co., *Sonne;* Castle Peak (Mt. Stanford), Nevada Co., *Sonne;* Mt. Lola, Nevada Co., *Lemmon.*

Refs.—ASTRAGALUS AUSTINAE Gray; B. & W. Bot. Cal. 1:156 (1876), type loc. Mt. Stanford, Nevada Co., *Lemmon;* Jepson, Man. 575 (1925). *Tragacantha austinae* Ktze. Rev. Gen. Pl. 2:943 (1891).

56. **A. agrestis** Dougl. PURPLE LOCO. Stems ascending, 4 to 12 inches high from a slender root-crown; herbage sparingly strigose; leaves 1½ to 3½ inches long; stipules lanceolate; leaflets 11 to 21, linear to oblong, usually retuse, 3 to 7 lines long; peduncles 1½ to 4½ inches long; racemes very dense, subcapitate or short-spicate, ¾ to 1½ inches long; bracts broadly oblong to lanceolate, 2 to 2½ lines long; rachis, bracts and calyces black- or white-hairy; flowers subsessile, 7 to 10 lines long; calyx-tube 2½ lines long, the linear-subulate teeth about ⅔ as long; corolla purple; banner narrowly oblong, much exceeding the wings, and these the keel; pods densely pilose, obliquely ovoid, 4 to 5 lines long, 1½ to 2 lines wide, 2-celled, the dorsal suture deeply sulcate; seeds roundish-reniform, 1 line long.

Adobe soil, 5400 feet: Lassen Co. North to Washington and Manitoba, east to Minnesota, south to New Mexico. June.

Geog. note.—Astragalus agrestis is a not infrequent species in the Great Basin and northward. As to California it enters only the northeastern part of the state, where it has been collected only once (Madeline plains, *Austin & Bruce*).

Refs.—ASTRAGALUS AGRESTIS Dougl.; Hook. Fl. Bor. Am. 1:148 (1834), type loc. plains of the Red River, Manitoba, *Douglas*, as synonym. *A. hypoglottis* var. *b* Hook. l.c. *Phaca agrestis* Piper, Contrib. U. S. Nat. Herb. 11:372 (1906). *A. goniatus* Nutt.; T. & G. Fl. 1:330 (1838), type loc. Rocky Mts. near the sources of the Platte River, *Nuttall.*

57. **A. mortonii** Nutt. MONTANA LOCO. Stout, often widely branched from base, ½ to 2 feet high; herbage strigulose; leaves 3 to 5 inches long; leaflets 13 to 21, oblong to obovate, obtuse or acute, 6 to 13 lines long; peduncles shorter or longer than the leaves; racemes densely flowered, spike-like, in fruit very crowded and 1½ to 5 inches long; flowers greenish-white or cream-color, 6 to 7 lines long, reflexed as they open, the fruit erect; calyx-teeth triangular, ⅕ as long as the broadly oblong tube; corolla greenish-white or cream-color; pods subcylindric or narrowly oblong, straight, grooved dorsally, incompletely 2-celled, 5 to 6 lines long, 1¼ lines wide, the ventral suture externally prominent; seeds numerous.

Sandy flats, 4000 to 8000 feet: desert valleys and cañons on the east side of the Sierra Nevada from Mono Co. to Modoc Co. East and north through the Great Basin to Utah, Montana and British Columbia. July-Aug.

Locs.—Mono Lake, *Brewer* 1831; Lundy, Mono Co., *Maud Minthorn;* Truckee, *Sonne;* Milford, Lassen Co., *T. Brandegee;* Goose Lake, Modoc Co., *Austin & Bruce* 2213.

Refs.—ASTRAGALUS MORTONII Nutt. Jour. Acad. Phila. 7:19 (1834), type loc. headwaters of the Missouri River, *Wyeth;* Jepson, Man. 575 (1925). *Phaca mortonii* Piper, Contrib. U. S. Nat. Herb. 11:372 (1906). *A. canadensis* var. *mortonii* Wats. Bot. King 68 (1871). *Tragacantha mortonii* Ktze. Rev. Gen. Pl. 2:946 (1891). *A. torreyi* Rydb. N. Am. Fl. 24:448 (1929), type loc. Empire City, Nev., *Torrey;* a synonym as evidenced by type spm. (N. Y. Bot. Gard.).

58. **A. minthorniae** Jepson comb. n. GOLD LOCO. Plants 6 to 12 inches high, the erect or ascending stems from a stout root-crown, or the stems very short and the leaves and peduncles tufted on them; herbage white-strigose; leaves ascending, 2 to 4 inches long; leaflets 13 to 19, oval to obovate, 2 to 6 lines long; racemes rather loose, many-flowered, 2 to 5 inches long; peduncles 1¾ to 3¼ inches long; flowers slender, 6 to 7 lines long; calyx more or less black-hairy (in flower, conspicuously so), the tube 1½ to 2 lines long, the lanceolate teeth ⅓ to ½ as long; corolla white, the keel purple-tipped; banner reflexed, exceeding the wings and keel; pods erect or ascending, oblong, abruptly acute at base and apex, nearly cylindric or slightly compressed, straight or nearly straight, white-shaggy, 6 to 10 lines long, 3 lines wide, nearly 2-celled by a yellow septum formed by the intrusion of the dorsal suture.

Gravelly slopes, 4000 to 5000 feet: eastern Mohave Desert. East to western Nevada. May.

Locs.—Barnwell, New York Mts., *T. & K. Brandegee.* Nev.: Gold Mt., *Purpus* 5939.

Refs.—ASTRAGALUS MINTHORNIAE Jepson. *Hamosa minthorniae* Rydb. Bull. Torr. Club 54:15 (1927), type loc. Pioche, Lincoln Co., Nev., *Maud Minthorn* 77.

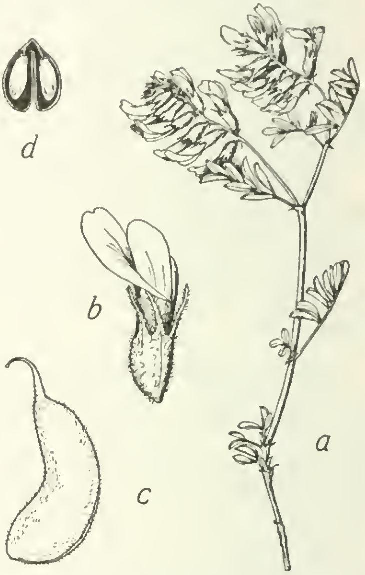

Fig. 214. ASTRAGALUS ANDERSONII Gray. *a*, fl. branch, × ½; *b*, fl., × 1½; *c*, pod, × 2; *d*, cross sect. of pod, × 2.

59. **A. malacus** Gray. TUFT LOCO. Plants erect, ½ to 1 foot high, the stems and basal leaves forming a dense tuft on the branched root-crown; herbage villous with spreading hairs; leaves 2½ to 3¾ inches long; leaflets 11 to 17, obovate, obtuse or truncatish, 4 to 9 lines long; peduncles surpassing the cauline leaves; spikes closely many-flowered, ¾ to 1½ (or 3) inches long, elongating in fruit; flowers 7 to 10 lines long; calyx dark-hairy, the slender teeth much shorter than the cylindric tube; corolla deep purple; pods rigid, linear-oblong, curved, shallowly grooved dorsally, incompletely 2-celled, 1 inch long, 2¼ to 2½ lines wide, shaggy-villous, widely spreading on recurved pedicels; seeds many.

Plains, valleys and montane flats, 4000 to 7100 feet: east of the Sierra Nevada from Inyo Co. to Modoc Co. North to eastern Oregon, east to western Nevada. May.

Locs.—Owens Valley (Bot. Cal. 1:151); Honey Lake, *T. Brandegee;* Madeline Plains, *C. C. Bruce* 2214; Fitzhugh Creek, Warner Mts., *L. S. Smith* 1084. Nevada: Summit sta., w. Mineral Co., *Shockley* 353; Reno, *T. Brandegee;* Truckee Pass, *Hillman.*

Refs.—ASTRAGALUS MALACUS Gray, Proc. Am. Acad. 7:336 (1868), type loc. Carson City, Nev., *Anderson;* Jepson, Man. 574 (1925). *Tragacantha malaca* Ktze. Rev. Gen. Pl. 2:946 (1891). *Hamosa malaca* Rydb. Fl. Rocky Mts. 496 (1917).

60. **A. andersonii** Gray. CARSON LOCO. (Fig. 214.) Stems several, tufted on a branched root-crown, ½ to 1 foot high; herbage gray-villous; leaves 1 to 3½ inches long; leaflets 13 to 25, oblong or obovate, 3 to 5 lines long; peduncles a little surpassing or often shorter than the leaves; racemes closely flowered, ¾ to 1¾ inches long; flowers 6 lines long; calyx-teeth subulate-setaceous, about as long as the campanulate tube; corolla yellowish-white or pinkish; pods sessile, linear-oblong, compressed, curved, grooved dorsally, densely villous, incompletely 2-celled, 6 to 8 lines long, 1¾ to 2 lines wide; seeds 16 to 20.

Valley flats, 4000 to 5000 feet: east side of the Sierra Nevada, occupying a narrow strip from Inyo Co. to Lassen Co., California, and in Washoe Co., western Nevada. May.

Locs.—Lone Pine Creek, Inyo Co., *Hall & Chandler* 7202; Bishop, *Heller* 8357; Chat, Lassen Co., *Stephenson;* Janesville, Lassen Co., *T. Brandegee;* Honey Lake, *T. Brandegee.*

Refs.—ASTRAGALUS ANDERSONII Gray, Proc. Am. Acad. 6:524 (1865), type loc. Carson City, Nev., *Anderson;* Jepson, Man. 576 (1925). *Tragacantha andersonii* Ktze. Rev. Gen. Pl. 2:943 (1891). *Hamosa andersonii* Rydb. Bull. Torr. Club 54:16 (1927).

61. **A. congdonii** Wats. FOOTHILL LOCO. Stems more or less branched, commonly decumbent at base, ¾ to 1 foot high; herbage loosely white-pilose, on the upper part of the stems the white hairs often mixed with some stiff black ones; leaves 1½ to 2½ inches long; leaflets 17 to 25, obovate to oblong, retuse or obtuse, 2 to 3 lines long; racemes very loose, elongate, on peduncles longer than the leaves; flowers 5 to 6 lines long; calyx-teeth triangular-subulate, nearly as long as the tube; corolla yellowish-white; pods linear, curved, somewhat compressed, puberulent, pendulous, grooved on the back, incompletely 2-celled, 1 inch long, 1 line wide; seeds numerous.

Dry rocky hillslopes, 1000 to 2000 feet: Amador Co. to Mariposa Co. May (fl. and fr.).

Locs.—Amador Co., *Hansen* 344; Pine Log, Tuolumne Co., *A. L. Grant* 718; Five-Mile Creek, Tuolumne Co., *A. L. Grant* 739; Hites Cove, Mariposa Co., *Congdon.*

Refs.—ASTRAGALUS CONGDONII Wats. Proc. Am. Acad. 20:360 (1885), type loc. Hites Cove, Mariposa Co., *Congdon;* Jepson, Man. 574 (1925). *Hamosa congdonii* Rydb. Bull. Torr. Club 54:20 (1927).

62. **A. atratus** Wats. var. **mensanus** Jones. MESA LOCO. Stems several from the branched root-crown, slender, loosely branched, sparsely leafy, erect, ¼ to 1¼ feet high; herbage greenish, very scantily strigulose, save that the leaflets are very markedly strigulose; leaves 1½ to 3½ inches long; leaflets 7 to 19, broadly oblong to linear, 2 to 4 lines long; racemes loosely 3 to 8-flowered, ½ to 2½ inches long; peduncles 1¼ to 3½ inches long, exceeding the leaves; flowers 3 lines long; calyx-teeth narrowly lanceolate, ⅓ to ½ as long as the tube; corolla white, purple at tip; pods subterete or a little flattened, acute, attenuate at base, narrowly grooved on the back, minutely pubescent, 7 lines long, 1¾ to 2 lines wide, the dorsal intrusion or fold narrow but deep, the ventral margin cord-like or thickened.

Sandy flats, 5900 feet: Inyo Co. (Darwin Mesa).

Note on habit and occurrence.—The petioles vary from 1 to 2½ inches long. The racemes are said to be secund. We have seen no specimens save those of the type collection. This variety appears to be much of a rarity.

Refs.—ASTRAGALUS ATRATUS Wats. Bot. King 69, pl. 11 (1871), type loc. Pah-Ute, Havallah and Toyabe ranges, Nev., *Watson* 265. *Tragacantha atrata* Ktze. Rev. Gen. Pl. 2:943 (1891). *Hamosa atrata* Rydb. Bull. Torr. Club 34:48 (1907). *Tium atratum* Rydb. N. Am. Fl. 24:394 (1929). Var. MENSANUS Jones, Proc. Cal. Acad. ser. 2, 5:665 (1895), type loc. Darwin Mesa, about 2 miles s. of the Mill Creek divide, Inyo Co., *Coville & Funston* 792. *Tium mensarum* Rydb. N. Am. Fl. 24:395 (1929).

A. atratus Wats. is cited for Mineral King by Coville (Contrib. U. S. Nat. Herb. 4:85) on the basis of *Coville & Funston* 1561 which is too scanty and too imperfect for certain determination, but may be A. bicristatus Gray as annotated by M. E. Jones. That station is not geographically and ecologically in keeping for A. atratus.

63. **A. didymocarpus** H. & A. Twin Loco. (Fig. 215.) Stems slender, commonly diffusely branched from base, 3 to 12 (or 24) inches high; herbage strigulose, the calyx hairs mostly blackish; leaves 1 to 3 inches long; leaflets 9 to 15, oblong to linear, cuneate, deeply notched at apex, 2½ to 5 lines long; spikes oblong-elliptic to capitate, very densely flowered, 3½ to 7 (or 12) lines long, the peduncles commonly exceeding the leaves; flowers remaining erect; corolla white and violet, 1½ to 2 lines long, scarcely exceeding the calyx; pods erect, short-ovate, deeply 2-lobed lengthwise by the intrusion of the dorsal suture, incompletely 2-celled, corrugated by strong transverse ridges, strigulose or setulose, 1 to 1½ lines long; seeds 2.

Interior valleys and foothills, 50 to 3100 feet: South Coast Ranges (infrequent) and San Joaquin Valley (mostly west side) south through the Mohave Desert to the Colorado Desert and San Diego Co. Arizona to Lower California. Mar.-Apr.

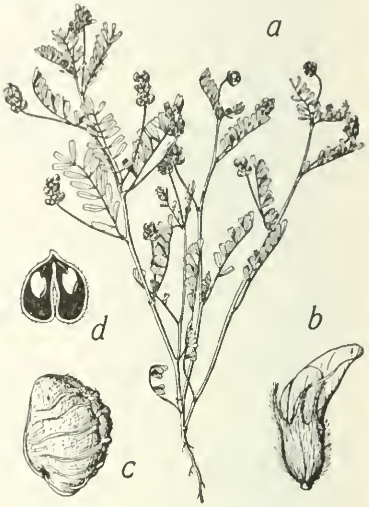

Fig. 215. Astragalus didymocarpus H. & A. *a*, habit, × ⅓; *b*, fl., × 4; *c*, pod, × 6; *d*, cross sect. of pod, × 6.

Geog. note.—This slender annual is, next to Astragalus gambelianus Nutt., the most widely distributed of any Californian species of this genus. Although it extends far eastward into the central Mohave Desert, we have no records from the Sierra Nevada foothills north of the San Joaquin River. A middle longitudinal band in the corolla is sometimes whitish, the rest purplish and veined. It is a uniform species, which is subject to little variation. The var. dispermus differs only in color of pubescence; it is like the species in the form of its fruit and especially in the details of the curved ridges on the lobes. The septal intrusion in the variety varies slightly in width but does not differ in this particular from the species. The stations for the species as cited below detail its range.

Locs.—South Coast Ranges: Kirker Pass, n. of Mt. Diablo, *Brewer* 1115; Livermore, *Greene;* Zapato Chino, se. Fresno Co., *T. Brandegee;* Palo Prieto Cañon, e. San Luis Obispo Co., *Jepson* 16,195. San Joaquin Valley: Antioch, *Davy* 934; Byron, *Bioletti;* Tracy, *C. F. Baker* 2782; Huron, *Eastwood;* Bakersfield, *Davy* 1706. Tehachapi Mts.: Caliente, *Jepson* 6753; Keene, *Jepson* 7162; Rowen, *Jepson* 6717. Mohave Desert: Rosamond, Kern Co., *Davy* 2205; Leonis Valley, *Davy* 2629; Ord Mt., *Jepson* 5878. Coastal S. Cal.: Santa Cruz Isl., *Jepson* 12,091; Tujunga Cañon, *Peirson* 2102; San Bernardino Valley, *Parish* 6897; Vandeventer ranch, Santa Rosa Mts., *Jepson* 1415; Dripping Spr., Temecula Creek, *Munz* 5096; Dehesa, San Diego Co., *T. Brandegee;* La Jolla, *Jepson* 11,874, *Newlon* 273; Paradise Valley, San Diego, *Cleveland.*

Var. **milesianus** Jepson comb. n. Corolla purple, 3 to 4 lines long; racemes capitate, the heads in fruit 7 lines long and as broad; pods glabrous, rounded-ovoid, 2 lines long.—San Luis Obispo Co.: Morro, *Barber;* San Luis Mt., *Summers* 203; San Luis Obispo, *Jones.*

Var. **dispermus** Jepson comb. n. Herbage grayish, strigulose; calyx conspicuously white-villous; pods hairy.—Arid mesas and valleys, 100 to 2600 feet: Mohave and Colorado deserts. East to Arizona, south to Lower California.

Locs.—Mohave Desert: Arrastre Cañon, n. side San Gabriel Mts., *Peirson* 398; Antelope Valley, *Davidson;* Mohave sta., *Munz* 10,098; Barstow, *Jepson* 5429; Danby, *Orcutt;* Goffs, *K. Brandegee.* Colorado Desert: Palm Sprs., Mt. San Jacinto, *Geo. B. Grant;* McCoy Wash, e. Riverside Co., *Hall* 5940; Indian Cañon, Collins Valley, ne. San Diego Co., *Jepson* 8851 (intergrade to the species); Blair Valley, e. San Diego Co., *Jepson* 8686; Carrizo Creek, *T. Brandegee.* Cismontane Riverside Co.: Coahuilla Valley, *Jepson* 13,745.

Var. **obispoensis** Jepson comb. n. Similar to the var. dispermus; pods glabrous.—San Luis Obispo.

Refs.—Astragalus didymocarpus H. & A. Bot. Beech. 334, t. 81 (1838), type from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. 291 (1901), ed. 2, 235 (1911), Man. 576 (1925). *Tragacantha didymocarpa* Ktze. Rev. Gen. Pl. 2:944 (1891). *Hesperastragalus didymocarpus* Hel. Muhl. 2:87 (1905). *A. catalinensis* Nutt. Jour. Acad. Phila. ser. 2, 1:152 (1848), type loc. Santa Catalina Isl., *Gambel. Hesperastragalus catalinensis* Rydb. Bull. Torr. Club 53:169 (1926). *H. compactus* Hel. Muhl. 2:218 (1906), type loc. Friant (Pollasky), Fresno Co., *Heller* 8156. Var. milesianus Jepson. *Hesperastragalus milesianus* Rydb. Bull. Torr. Club 53:169 (1926), type loc. San Luis Obispo, *M. M. Miles*. Var. DISPERMUS Jepson. *A. dispermus* Gray, Proc. Am. Acad. 13:365 (1878), type loc. Wickenburg, Ariz., *Palmer;* Jepson, Man. 576 (1925). *Hesperastragalus dispermus* Hel. Muhl. 1:137 (1906). Var. OBISPOENSIS Jepson. *Hesperastragalus obispoensis* Rydb. Bull. Torr. Club 53:167 (1926), type loc. San Luis Obispo, *Jones* 3229.

64. **A. gambelianus** Sheld. LITTLE BILL LOCO. Stems slender, many-branched from base, 3 to 12 inches high; herbage rather sparsely appressed-pubescent, the calyces and often the stems with black hairs; leaves 3/4 to 1 1/4 inches long; leaflets 7 or 9 to 13, narrowly cuneate-oblong, emarginate, 2 to 4 lines long; racemes 4 to 8 lines long, 2 1/4 to 3 lines wide, several-flowered, on slender peduncles, exceeding the leaves; flowers soon curving downward; calyx-teeth narrow, about equaling the tube; corolla 1 line long, violet or violet-tipped; pods deflexed, 1 1/2 lines long, well exserted from the calyx, hirsute-pubescent, deeply grooved on the back and thus incompletely 2-celled, the lobes strongly obcompressed and with wavy transverse lineations which are more prominent at the margins; seeds 2.

Open hill slopes and valley flats, 15 to 4000 feet: Coast Ranges from Humboldt Co. to San Luis Obispo Co., frequent; south to the San Bernardino Valley; also in the Great Valley and Sierra Nevada foothills, but rare. Mar.-May.

Geog. note.—This slender annual, Astragalus gambelianus, a feature of the vernal flora in the foothills, is the most common and widely distributed species of Astragalus in California. Closely related to A. didymocarpus, it extends further northward than that species and further eastward in the Great Valley region, but is absent from the deserts. In the Sierra Nevada foothills it appears to be extremely rare and is, indeed, so far as our records go, one of only two Astragali known in the foothill region, at least north of the San Joaquin River.

Locs.—Coast Ranges: Trinity River Valley near Willow Creek, Humboldt Co., *Tracy* 5147; Potter Valley, e. Mendocino Co., *Purpus* 26; head of South Mill Creek, Ukiah, *Jepson* 9254; Mt. St. Helena, *Greene;* Calistoga, e. of, on Pope Valley grade, *Jepson* 13,753; Conn Valley, Napa Range, *Jepson* 10,330; Pine Peak, Vaca Mts., *Jepson* 13,752; Lagunitas, Marin Co., *M. L. Hutchinson;* Hunter Pt., San Francisco, *Jepson* 12,714; Berkeley, *Jepson* 13,750; Mt. Diablo, *Brewer* 1071; Livermore, *Jepson* 13,751; Corral Hollow, *Jepson* 9580; Belmont, San Mateo Co., *Davy* 785; Mt. Hamilton, *Jepson* 4218; Fremont Peak, San Benito Co., *Elmer* 4636; betw. Coalinga and Parkfield, *Peirson* 5640; San Luis Obispo, *Summers* 204. Great Valley: Anderson, Shasta Co., *Alice King;* Red Bluff, *Blankinship;* Crane Creek, w. Tehama Co., *Jepson* 13,749; College City, Colusa Co., *Alice King;* Lathrop, *K. Brandegee;* Tulare, *Davy*. Sierra Nevada foothills: Stillwater, Shasta Co., *M. S. Baker;* Four Corners, *M. S. Baker;* Sweetwater Creek, Eldorado Co., *K. Brandegee;* Angels Camp, Calaveras Co., *Davy* 1483; Gwin Mine, Calaveras Co., *Jepson* 1792; Columbia, Tuolumne Co., *A. L. Grant;* Knights Ferry, e. Stanislaus Co., *F. W. Bancroft;* Friant, Fresno Co. (Muhl. 2:218). Tehachapi Mts.: Rowen, *Jepson* 6718. S. Cal.: Saugus, *Geo. B. Grant* 5438; Santa Cruz Isl., *T. Brandegee;* San Bernardino, *Parish* 3649.

Refs.—ASTRAGALUS GAMBELIANUS Sheld. Minn. Bot. Stud. 1:21 (1894). *A. nigrescens* Nutt. Journ. Acad. Phila. ser. 2, 1:153 (1848), type loc. Santa Catalina Isl., *Gambel;* Jepson, Fl. W. Mid. Cal. 291 (1901), ed. 2, 235 (1911), Man. 577, fig. 567 (1925); not A. nigrescens Pall. (1800). *A. elmeri* Greene, Erythea 3:98 (1895), type loc. Ross Valley, Marin Co., *Drew*. *Hesperastragalus nigrescens* Hel.; Jones, Rev. N. Am. Astrag. 284 (1923). *H. gambelianus* Hel. Muhl. 2:87 (1905).

65. **A. albens** Greene. LONE LOCO. Stems many from base, diffuse, 5 to 6 inches high; herbage silvery-pubescent; leaves 1 to 2 inches long; leaflets 5 to 11, obovate, obtuse, 2 1/2 to 4 lines long; racemes loose, few-flowered, the peduncles shorter than the leaves; flowers 3 lines long; calyx-teeth lanceolate-subulate, nearly as long as the turbinate tube; corolla purple, 3 lines long; pods sessile, linear, compressed, curved, strongly grooved dorsally, 2-celled, strigulose, 6 lines long.

Dry flats, 4000 to 5800 feet: desert side of the San Bernardino Mts. May.

Field note.—A highly localized and rarely collected endemic, Astragalus albens was discovered long ago, in 1882, at Cushenbury Springs by the Parish brothers. In recent years it has been found once more in the same region, by Peirson, at Cactus Flat.

Refs.—ASTRAGALUS ALBENS Greene, Bull. Cal. Acad. 1:156 (1885), type loc. Cushenbury Sprs., *S. B. & W. F. Parish* 1274; Jepson, Man. 577 (1925). *Homalobus albens* Rydb. Bull. Torr. Club 54:22 (1927).

66. **A. breweri** Gray. SONOMA LOCO. Stems filiform or nearly so, branching, 1 to several from base, 3 to 9 (or 12) inches high; herbage sparsely strigulose or

subglabrous; leaves 1¼ to 1½ inches long; leaflets 7 to 11, obovate to narrowly oblong-cuneate, obtuse to obcordate, 2 to 4 lines long; heads closely (3 or) 5 to 9-flowered, the flowers 4 to 4½ lines long; calyx black-hairy; calyx-teeth lanceolate-subulate, ½ to as long as the tube; corolla tinged violet-purple; pods ovate or oblong-ovate, silvery-pubescent, 2-celled, grooved on the back, 3 to 4 lines long, the style developed into a stout straight beak about as long as the body; seeds 6.

Grassy moist meadows of openly wooded hills or valley floors, 300 to 1500 feet: North Coast Ranges from Mendocino Co. to Marin Co. Apr.-May, fr. June.

Tax. note.—Though differing so strongly in their pods, Astragalus breweri and A. rattanii are much alike in habit, in foliage and in inflorescence. The flowers are scarcely distinguishable. The keel of A. breweri, usually sharply truncate, is about ⅔ the length of the wings, that of A. rattanii, commonly with rounded apex, is almost as long as the wings. Both species are limited to the North Coast Ranges, but their ranges appear to be mutually exclusive.

Locs.—Willits, *Davy & Blasdale* 5073; Scotts Valley, Lake Co., *Tracy* 1647; Sonoma, *Brewer* 979; St. Helena, *Clara Hunt;* Mt. Tamalpais, *Newlon* 88.

Refs.—ASTRAGALUS BREWERI Gray, Proc. Am. Acad. 6:207 (1864), type loc. Sonoma Valley, *Brewer;* Jepson, Fl. W. Mid. Cal. 291 (1901), ed. 2, 235 (1911), Man. 577, fig. 568 (1925). *Tragacantha breweri* Ktze. Rev. Gen. Pl. 2:943 (1891).

67. **A. tener** Gray. ALKALI LOCO. Stems slender, branched from base, 3 to 12 inches high, minutely appressed-pubescent; leaves 1 to 1¾ inches long; leaflets 9 to 15, linear or cuneate-oblong or -obovate, acute or emarginate, 3 to 5 or 8 lines long, the lower sometimes obcordate, 2 lines long; flowers purplish, 5 lines long, in heads or short racemes, the slender peduncles longer than the leaves; calyx-teeth subulate, more than half as long as the narrow-campanulate tube; pods linear, subcylindric, 5 to 7 lines long, lightly appressed-pubescent, strongly grooved on the back by the inturning of the dorsal suture, completely 2-celled; style persistent in fruit, short, hooked; seeds 6 to 10.

Alkaline flats or plains, 5 to 800 feet: Sacramento Valley; South Coast Ranges from Alameda Co. to Monterey Co. Apr.-May.

Field note.—On subalkaline flats Astragalus tener is most commonly found in little colonies. When small-sized it is in habit rather clover like. The keel is commonly half as long as the banner, the wings three-fourths as long. The leaflets assume two markedly different shapes, narrowly linear and acute, and shortly and narrowly obcordate, but there are intergrade forms. Narrowly linear leaflets, either acute or emarginate, may be found in the same collection from one colony a few feet across where the individuals are evidently of common parentage (Vacaville, *Jepson* 13,755); likewise, narrowly linear acute leaflets and obcordate leaflets may be found in one collection (Vacaville, *Jepson* 13,758); sometimes, again, such leaf forms may be found on one individual (Suisun, *Jepson* 9619). The flowers are usually a little reflexed after anthesis, the straight fruiting peduncles spreading or somewhat deflexed.

Locs.—Buckeye, Shasta Co., *Blankinship;* Yuba City (w. of), Sutter Co., *Jepson* 13,759; College City, Colusa Co., *Anna Jeffreys;* Vacaville, *Jepson* 13,755; Suisun, *Jepson* 9619; Oakland, *Blasdale;* Alameda, *Tidestrom;* Newark, *Davy* 1112; Livermore, *Michener & Bioletti;* Soledad, Monterey Co., *Jones* 3155.

Var. bruceae Jones. Pods purple-mottled, flattish.—Volcanic fields between Chico and Oroville. *Heller* 11,286 (Chico-Oroville) is an excellent match for the type spm. (Baker Herb.).

Refs.—ASTRAGALUS TENER Gray, Proc. Am. Acad. 6:206 (1864), type from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. 291 (1901), ed. 2, 235 (1911), Man. 578, fig. 569 (1925). *A. hypoglottis* var. *strigosus* Kell. Proc. Cal. Acad. 2:115, fig. 37 (1861), type loc. vic. of San Francisco. *A. strigosus* Sheld. Minn. Bot. Stud. 1:24 (1894). *Hamosa kelloggiana* Rydb. Bull. Torr. Club 54:323 (1927). *A. pauperculus* Greene, Pitt. 3:224 (1897), type loc. "upper Sacramento", *Greene. A. titi* Eastw. Bull. Torr. Club 32:195 (1905), type loc. Seventeen Mile Drive, Monterey, *Clemens. Phaca astragalina* var. *b* H. & A. Bot. Beech. 334 (1838), type from Cal., *Douglas. Tragacantha tenera* Ktze. Rev. Gen. Pl. 2:948 (1891). *Hamosa tenera* Rydb. Bull. Torr. Club 54:322 (1927). *A. tener* var. *rattanoides* Jones, Rev. N. Am. Astrag. 268 (1923), type loc. Mt. Eden, *Brandegee. Hamosa rattanoides* Rydb. Bull. Torr. Club 54:324 (1927). Var. BRUCEAE Jones, Rev. N. Am. Astrag. 268 (1923), type loc. Butte Co., *Mrs. Bruce* 2430. *Hamosa bruceae* Rydb. Bull. Torr. Club 54:323 (1927).

68. **A. rattanii** Gray. HUMBOLDT LOCO. Stems several to many from base, 4 to 14 inches high; herbage sparsely strigose-pubescent, the upper surface of the

leaves glabrous; leaves 1¼ to 2 inches long; leaflets 11 to 15, narrowly cuneate-obovate or -oblong, emarginate, 2 to 5 lines long; flowers in capitate clusters terminating peduncles longer than the leaves; calyx commonly black-hairy; calyx-teeth lanceolate-subulate, ½ to ⅗ as long as the campanulate tube; corolla violet or white, 4 to 5 lines long; pods 3 to 7 in a capitate cluster, narrowly linear, attenuate, compressed, grooved dorsally, almost 2-celled, (1 or) 2 to 2¼ inches long; seeds many.

Open grassy slopes, 1500 to 2500 feet: North Coast Ranges from Colusa Co. to Humboldt Co. May-June, fr. July.

Locs.—Mendocino Co.: Potter Valley, *Nettie Purpus;* Mt. Sanhedrin, *Purpus* 1070; Williams Creek, n. of Round Valley, *Cronemiller* 640. Humboldt Co.: Alder Pt., Eel River, *Tracy* 1903; Buck Mt., *Tracy* 4241; Bridgeville, *Blankinship;* Kneeland Prairie, *Tracy* 7486; Jarnigan's, *Chesnut & Drew.*

The pods of Astragalus rattanii are long (usually 2 to 2¼ inches) and straight, but often they are curved. On the east slope of the inner Coast Range occurs a form with somewhat shorter pods (1 to 1½ inches long): Salt Gulch, Greasewood Hills, w. Tehama Co., *Jepson* 13,756; Black Butte, Colusa Co., *Rattan;* betw. Mountain Home and Epperson sta., w. Colusa Co., *K. Brandegee.*

Var. **clarianus** Jepson comb. n. Pods drawn down to a stipe-like base 2 to 3 lines long, attenuate at apex.—Conn Valley, Napa Range.

Refs.—ASTRAGALUS RATTANII Gray, Proc. Am. Acad. 19:75 (1883), based on spms. from prairies n. of Mad River, Humboldt Co., and from Rattlesnake Creek, Mendocino Co., *Rattan;* Jepson, Man. 578, fig. 571 (1925). *Hamosa rattanii* Rydb. Bull. Torr. Club 54:324 (1927). Var. CLARIANUS Jepson. *A. clarianus* Jepson, Man. 578, fig. 570 (1925), type loc. near St. Helena, Napa Range, *Clara A. Hunt. Hamosa clariana* Rydb. N. Am. Fl. 24:427 (1929).

69. **A. nuttallianus** DC. Texas Loco. Stems several from the base, diffuse or prostrate, 3 to 10 inches long; herbage pubescent with stiffish white appressed hairs; leaves in a basal tuft and scattered along the branches, ½ to 1¼ inches long; leaflets 9 to 13, linear to oblong, acute at base and apex, 2½ to 3 lines long; racemes capitate, the peduncles slender, exceeding the leaves; flowers 2 to 2½ lines long; calyx-teeth narrow, about as long as the tube; corolla whitish or blue, the keel with obtuse or acute inflexed or upturned tip; pods nearly or quite 2-celled, linear, somewhat curved, compressed, deeply grooved dorsally, strigulose, 7 to 9 lines long; seeds 14 to 16.

Sandy mesas and alkaline flats, 1100 to 4000 feet: Laguna and San Jacinto mountains; eastern Mohave Desert; Inyo Co. East to Texas and Arkansas. Apr.-May.

Field note.—Astragalus nuttallianus DC., only a few times collected in California, is in its habit very much like a Lotus. The apex of the keel of the corolla is very variable, in its acute form designated as var. acutirostris Jepson.

Locs.—Laguna and San Jacinto ranges: Sentenac Cañon, e. San Diego Co., *Jepson* 12,458; San Jacinto Lake, *Hall* 434 (leaves sharply acute); Murray Cañon, Palm Sprs., Mt. San Jacinto, *Peirson* 584. Eastern Mohave Desert: Goffs, *Newlon* 540; Barnwell, *K. Brandegee.* Inyo Co.: Hanaupah Cañon, Panamint Range, *Jepson* 7065.

Var **acutirostris** Jepson comb. n. Corolla-keel prolonged at apex into a beak.—Sandy valleys, 1000 to 4000 feet: western Colorado Desert; Mohave Desert; Inyo Co. Apr.-May (fl. and fr.). This form is like the species in every detail of habit, stems, leaves, inflorescence, flowers and fruit, save only that the corolla is often beaked. Since there are transition forms to the species in even this particular of the beak, A. acutirostris Wats. has no specific value and probably little varietally. Nor is it segregated geographically.

Locs.—Jacumba, *T. Brandegee;* Indian Cañon, Collins Valley, e. San Diego Co., *Jepson* 8851a; betw. Stoddard Well and Ord Mt., *Jepson* 5916; Amargo, Mohave Desert, *Jepson* 15,575; Lone Pine, Inyo Co., *T. Brandegee.*

Refs.—ASTRAGALUS NUTTALLIANUS DC. Prod. 2:289 (1825); Jepson, Man. 579 (1925). *A. micranthus* Nutt. Jour. Acad. Phila. 2:122 (1821), type loc. plains of the Red River, *Nuttall;* not A. micranthus Desv. (1814). *Hamosa nuttalliana* Rydb.; Small, Fl. Se. U. S. ed. 2, 617 (1913). *A. streptopus* Greene, Bull. Cal. Acad. 1:155 (1885), type loc. Mohave Desert, *Curran. Hamosa emoryana* Rydb. Bull. Torr. Club 54:327 (1929), type loc. El Paso, Texas, *Wright* 1359. *Tragacantha micrantha* Ktze. Rev. Gen. Pl. 2:941 (1891). A. sp. Vasey & Rose, Contrib. U. S. Nat. Herb. 1:15 (1893), type loc. Cedros Isl., L. Cal., *Vasey & Rose. A. cedrosensis* Vasey & Rose, l.c., as synonym. *A. nuttallianus* var. *cedrosensis* Jones, Rev. N. Am. Astrag. 270 (1923). *A. pertenuis*

Greene, Lflts. 2:42 (1910), type loc. Los Angeles Bay, L. Cal., *Palmer*. *Hamosa pertenuis* Rydb. Bull. Torr. Club 54:329 (1927). Var. ACUTIROSTRIS Jepson. *A. acutirostris* Wats. Proc. Am. Acad. 20:360 (1885), type loc. Brown Ranch, Mohave Desert, *S. B. & W. F. Parish*; Jepson, Man. 579, fig. 572 (1925). *Oxytropis acutirostris* Jones, Proc. Cal. Acad. ser. 2, 5:677 (1895). *Aragallus acutirostris* Hel. Cat. N. Am. Pl. 4 (1898). *Hamosa acutirostris* Rydb. Bull. Torr. Club 54:331 (1927).

24. **OXYTROPIS** DC.

Ours caespitose plants with the leaves and peduncles crowded or matted on the branched root-crown. Keel prolonged at the apex into a slender beak. Otherwise much as in Astragalus.—Species 150, all north temperate regions. (Greek oxus, sharp, and tropis, keel.)

Bibliog.—Gray, A., [A revision and arrangement of the N. Am. species of] Oxytropis (Proc. Am. Acad. 6:234–236,—1864); A revision of the N. Am. species of the genus Oxytropis DC. (l.c. 20:1–7,—1884). Greene, E. L., [Notes on Aragallus] (Pitt. 3:208–212,—1897). Nelson, A., The western species of Aragallus (Erythea 7:57–64,—1899).

Pods erect or ascending.
  Herbage white-silky; leaves ½ to 2¾ inches long.
    Pods ovate, thin-walled, 4 to 5 lines long; peduncles not surpassing the leaves........ 1. *O. oreophila.*
    Pods oblong, subcoriaceous, 6 to 9 lines long; peduncles conspicuously surpassing the leaves........2. *O. parryi.*
  Herbage viscid-pubescent; leaves 2½ to 3½ inches long........3. *O. viscida.*
Pods deflexed; herbage silky-villous; leaves 1½ to 2½ inches long........4. *O. deflexa.*

1. **O. oreophila** Gray. Plants ½ to 1 inch high, the peduncles and leaves densely matted on the branched root-crown; herbage silvery-pubescent; leaves ½ to ¾ inch long; leaflets 5 to 13, lanceolate to oblong, acute, 2 to 3 lines long; peduncles ¼ to 1 inch long; flowers 4 to 4½ lines long; calyx black-hairy, its linear teeth about as long as the tube; corolla purple; pods elliptic-ovate, abruptly short-acute, thin-walled, distinctly inflated, conspicuously cross-wrinkled, 5 lines long, 2½ to 4 lines wide.

High montane, on rocky slopes and dry ridges, 7000 to 11,500 feet: San Bernardino Mts. East to southern Nevada and Utah. Aug.-Sept.

Locs.—San Bernardino Mts.: Falls Creek, *L. Gardner*; Mt. San Gorgonio, *Blasdale*. Nev.: Mt. Irish, *Purpus* 6331.

Refs.—OXYTROPIS OREOPHILA Gray, Proc. Am. Acad. 20:3 (1885), based on spms. from the Aquarius plateau, mts. of Utah, *Ward*, and Mt. San Gorgonio, *Wright, Lemmon*; Jepson, Man. 579 (1925). *Aragallus oreophilus* Nels. Erythea 7:59 (1899).

2. **O. parryi** Gray. Plants 1 to 2¾ inches high, the leaves and peduncles densely tufted or matted on the root-crown; herbage silvery-pubescent; leaves ½ to 1¾ inches long; leaflets 11 to 15, oblong to narrowly ovate, 1½ to 2 lines long; peduncles scapose, ¾ to 1¾ inches long, conspicuously longer than the leaves, bearing at the summit 1 or 2 flowers; flowers 4 to 5 lines long; calyx strigose with black and white hairs, its linear teeth nearly as long as the tube; corolla purple; pods oblong, acute, densely grayish-pubescent, grooved ventrally, 6 to 9 lines long, 1½ to 2 lines wide; ventral suture bearing a broad septum.

Mountain summits, 8500 to 12,000 feet: White Mts. East to Utah, Wyoming and New Mexico. June-Sept.

Locs.—White Mts.: Sheep Mt., *Duran* 2597. Utah: La Sal Mts., *Purpus* 6574.

Refs.—OXYTROPIS PARRYI Gray, Proc. Am. Acad. 20:4 (1884), type loc. "Rocky Mts. of northern N. Mex. and Colo. near the limit of trees", *Parry*. *Aragallus parryi* Greene, Pitt. 3:211 (1897). *O. uralensis* var. *pumila* Gray, Proc. Am. Acad. 6:235 (1864); not O. uralensis var. pumila Ledeb. (1831). *O. arctica* Bunge, Sp. Gen. Oxytr. 97 (1874) in part.

3. **O. viscida** Nutt. Stems caespitose from a stout branching root-crown, 4 to 8 (or 13) inches high; herbage viscid-pubescent, strongly scented; leaves 2½ to 3½ inches long; leaflets 25 to 33, oblong, revolute, acute, 2 to 3 lines long; peduncles

equaling or exceeding the leaves, bearing rather dense sub-cylindric spikes ¾ to 1½ inches long; flowers 5½ lines long; corolla white, with strongly beaked keel; pods terete, incompletely 2-celled by intrusion of the seed-bearing suture.

Rocky slopes, 11,000 to 12,200 feet: east wall of the southern Sierra Nevada in Inyo Co.; White Mts. North to eastern Oregon and Alaska, east to Wyoming and Quebec. July.

Locs.—Sierra Nevada, e. slope: Upper Lake, Baker Creek, *Duran* 1815; Coyote Creek promontory, Green Lake region, *Peirson* 599. White Mts.: Sheep Mt., *Jepson* 7318.

Refs.—OXYTROPIS VISCIDA Nutt.; T. & G. Fl. 1:341 (1838), type loc. "Rocky Mts. near sources of the Oregon", *Nuttall;* Jepson, Man. 579 (1925).

4. **O. deflexa** DC. var. **culminis** Jepson var. n. Plants 3 to 9 inches high, the leaves and peduncles congested on the branched root-crown; peduncles naked, ascending, 3½ to 7 inches long; herbage silky-villous; leaves 1½ to 2½ inches long; leaflets 19 to 25, oblong-lanceolate, 1½ to 2½ lines long; fruiting racemes 1 to 2 inches long; bracts lanceolate, 1 line long; flowers 3½ lines long; calyx with long white and short black hairs intermixed, its tube 1¼ lines long, the teeth linear-subulate, 1 line long; corolla whitish, purplish-tipped; pods deflexed, oblong, abruptly short-beaked, 5 to 7 lines long, 1½ to 1¾ lines wide, black- and white-hairy, nearly completely 2-celled by the intrusion of the ventral suture.—(Plantae caespitosae caudice ramoso congesto; herbae sericato-lanatae; folia 19–25-foliolata, unc. 1½–2½ longa; calyx pubescens, capillibus nigribus et albis intermixtis, tubo lin. 1¼ longo, dentibus lineari-subulatis, lin. 1 longis; legumina deflexa, albo- et nigripubescentia, oblonga, abrupte brevirostrata, lin. 5–7 longa, fere sutura ventralis intrusa bilocularia.)

Moist meadows, 9000 to 9500 feet: White Mts., Inyo Co. East to Wyoming and Colorado. June-Aug.

Note on occurrence and habit.—This variety, the reduced alpine form, is known in California only from the White Mts., eastern Inyo Co., where it has been collected on Cottonwood Creek by Victor Duran (no. 1650, type). The species, inhabiting Siberia and North America from Alaska to New Mexico, with its branched leafy stems, is usually much taller, or even if congested, the leaves and peduncles exceed in size those of the California plant.

Refs.—OXYTROPIS DEFLEXA DC. Astrag. 96 (1802). *Astragalus deflexus* Pall. Act. Acad. Petrop. 3^2:268, pl. 15 (1783), type from s. Siberia. Var. CULMINIS Jepson.

25. **OLNEYA** Gray

Tree with thin scaly bark, the branches armed with stout spines in pairs below the leaves. Leaves pinnate, with entire leaflets. Flowers few, in axillary racemes. Banner orbicular, deeply emarginate. Stamens diadelphous (9 and 1). Style bearded above. Pod thick, 1 to 5-seeded, tardily dehiscent.—Species 1. (S. T. Olney, 1812–1878, Rhode Island botanist.)

1. **O. tesota** Gray. DESERT IRONWOOD. Broad-crowned tree 15 to 25 feet high; leaves 1½ to 3 inches long; leaflets 5 to 8 pairs, cuneate-oblong or -obovate, 3 to 10 lines long; spines 1 to 4 lines long; racemes loose, ½ to 1¼ inches long; flowers violet-purple, 4 to 5 lines long; pods oblong, more or less pubescent and often provided with tack-shaped glands, ½ to 3 inches long, 1 to 8-seeded, more or less constricted between the seeds; seeds ovoid-globose, 4 to 6 lines long.

Desert valleys, chiefly in washes or about springs, 100 to 500 feet: Colorado Desert. East to Arizona and south to Sonora and Lower California. May.

Note on habit.—Olneya tesota, one of the finest and, save for Populus fremontii, the largest tree in the desert, is marked by its heavy foliage with a blue-green aspect reminding the traveler of the hue of Quercus douglasii. The crowns are usually tall with distinct trunks. The site of Yaqui Well in the western Colorado Desert is marked by a small grove of fairly large Desert Ironwood trees. One, 30 feet high, has a trunk diameter of 21 inches at 2 feet; another, 32 feet high, has a trunk diameter of 17 inches at 1 foot, both trees having been measured in 1920.

Along the lower Colorado River we measured a number of large trees of this species in 1912. At Ehrenberg, Ariz., an individual 20 feet high and 35 feet in crown diameter, had a trunk 14 inches in diameter at 3½ feet. In the lower Palo Verde Valley an individual 31 feet high and 26 feet in crown diameter was 14 inches in trunk diameter at 2 feet. In the region of Milpitas, eastern Colorado Desert, the mesas sloping up from the river sometimes bear remarkable woodlands of Olneya tesota and Cercidium torreyanum. Near Milpitas a tree of Olneya tesota 46 feet high had a trunk diameter of 32 inches at 1 foot, the smallest part of the 4 foot trunk. Another individual, 32 feet high and with a crown diameter of 47 feet, had a trunk diameter of 26⅔ inches.

The flowers, produced mostly on the upper part of the crown, appear in May, after which the old leaves fall and the new leaves come. The very hard and heavy wood is used by the desert Indians for arrow parts and tool handles.

Locs.—Yaqui Well, e. San Diego Co., *Jepson* 8790; Pilot Knob, se. Colorado Desert, *Jepson;* Shavers Well near Mecca, *Jepson;* Coachella, *Clary;* Chuckwalla Range; Riverside Mts., e. Riverside Co., *Jepson* 5243; Whipple Mts., along Colorado River, *Jepson* 5223.

Refs.—OLNEYA TESOTA Gray, Mem. Am. Acad. n. s. 5:328 (1855), type loc. tablelands of the Gila River, Ariz., *Thurber, Gray;* Torr. Pac. R. Rep. 7^3:10, pl. 5 (1856). Jepson, Silva Cal., 261 (1910), Man. 580, fig. 573 (1925).

26. **SESBANIA** Scop.

Herbs or shrubs with pinnate leaves and numerous entire leaflets. Flowers commonly yellow, 1 to several on slender axillary peduncles. Calyx broadly campanulate with 2 deciduous bractlets at base. Banner circular or oval; wings oblong; keel blunt. Stamens diadelphous (9 and 1). Ovary mostly stipitate, many-ovuled. Fruit elongated-linear, partitioned between the seeds.—Species about 40, warm regions of both hemispheres. (Sesban, Arabic name of one of the species.)

1. **S. macrocarpa** Muhl. COLORADO RIVER HEMP. Annual, 3 to 10 feet high; leaves exceeding the flowers; leaflets 13 to 41 pairs, narrowly oblong to linear, mucronulate, 5 to 14 lines long; calyx-teeth short, acute, salient; corolla yellowish, brownish-mottled, 6 to 7½ lines long; pods 4 to 9 inches long, 1 to 2⅓ lines wide.

Overflowed lands, 5 to 200 feet: lower Colorado River and Colorado Desert. East to Virginia and Florida, south to Mexico. Sept.-Nov.

The plants of the Arizona-Sonora region have been separated (as Sesban sonorae Rydb.) from those of the Mississippi region (S. exaltatus Rydb.), but we find, by careful scrutiny of a long series, that the presumed differences (merely those of degree) disappear. Specimens from Culiacan, Sinaloa, Mex. (T. Brandegee), show as many as 82 leaflets (not merely "16–30"), 45 seeds to the pod (not merely "15–30"), while the calyx-lobes are no more "subulate" than in some specimens of the Mississippi Valley. Other western specimens fortify this argument.

Econ. note.—Along the lower Colorado River the plant is very abundant, developing on the bottom lands in June after the fall of the spring floods in the river. It is a fiber plant producing smooth, lustrous, and very strong white filaments which are used by the Yuma Indians for nets and fish-lines. In the Palo Verde Valley the seeds are used by the settlers for chicken feed. This species is, too, as we learn from I. T. Weeks, used in cultivation in the Imperial Valley as a cover plant to shade watermelons and as a soil builder in grape-fruit orchards.

Locs.—Palo Verde Valley, *Jepson* 5257; Imperial, *Parish* 8309; Cameron Lake, Colorado Desert, *T. Brandegee;* Calexico, *Davy* 8015; Yuma, *W. H. Holabird.*

Refs.—SESBANIA MACROCARPA Muhl.; Raf. Fl. Ludov. 137 (1817), type loc. New Orleans, La.; Jepson, Man. 580, fig. 574 (1925). *Darwinia exaltata* Raf. Fl. Ludov. 106 (1817). *Sesban exaltatus* Rydb. N. Am. Fl. 24:204 (1924). *Sesbania macrocarpa* var. *picta* Wats. Proc. Am. Acad. 24:46 (1889), type loc. Guaymas, Sonora, *Palmer. Sesban sonorae* Rydb. N. Am. Fl. 24:205 (1924), based on last. *Sesban macrocarpa* Sta. Contrib. U. S. Nat. Herb. 23:477 (1922).

27. **VICIA** L. VETCH. TARE

Annual or perennial herbs with weak angular stems, often slightly climbing. Leaves pinnate, with several to many leaflets and semi-sagittate stipules, the rachis ending in a simple or branched tendril. Flowers solitary or racemose, axillary, the racemes one-sided. Calyx 5-toothed, the three lower teeth often longer. Banner oblong, or appearing so by the turning back of the edges; wings united to the middle of the keel. Stamens diadelphous (9 and 1) or monadelphous below. Style filiform with a tuft of hairs below the stigma all around or sometimes only on the back. Pod flat, 2 to several-seeded. Seeds globose, the funiculus expanded above to cover the hilum, thus arillate. Cotyledons remaining under ground in germination.—Species about 200, all continents except Australia. (Classical Latin name.)

Annuals or biennials.
Flowers 5 to 10 lines long.
Flowers many in dense racemes; corolla crimson..........1. *V. villosa.*
Flowers 1 to 2 in the axils, subsessile; corolla-banner purple, wings red..........2. *V. sativa.*
Flowers 1½ to 3 lines long.
Pods pubescent, 2-seeded; calyx-teeth hirsutulose, longer than the tube..........3. *V. hirsuta.*
Pods glabrous.
Calyx-teeth subglabrous or hirsutulose, about equaling (rarely a little longer than) tube; pods 4 to 6 lines long, 3 to 6-seeded..........4. *V. tetrasperma.*
Calyx-teeth pubescent, about ¼ as long as tube; pods 11 to 12 lines long, 4 or 5-seeded..........5. *V. exigua.*
Perennials; flowers several to many, in a raceme on an elongated peduncle.
Leaflets 8 to 12; peduncles 3 to 8-flowered; flowers bluish and whitish; pods not blackening in drying.
Herbage glabrous or nearly so; stems straightish..........6. *V. americana.*
Herbage finely pilose-pubescent; stems zigzag..........7. *V. californica.*
Leaflets 16 to 30; peduncles 7 to 18-flowered.
Corolla reddish-purple; pods 1½ inches long, blackening in drying..........8. *V. gigantea.*
Corolla blue-purple; pods ¾ inch long, not blackening..........9. *V. cracca.*

1. **V. villosa** Roth. CRIMSON VETCH. Stems 2 to 4 feet long, mostly simple, from an annual or biennial root; herbage puberulent; leaves nearly sessile; leaflets 16 to 24, oblong to linear, 4 to 12 lines long; peduncles axillary, shorter than or equaling the leaves; racemes dense, 2 to 2½ inches long; flowers 5 to 7 lines long, becoming reflexed; corolla crimson, fading indigo-blue; banner cordate at apex, at base shortly spurred; pods glabrous, ¾ to 1¼ inches long, 4 to 4½ lines wide.

Fields, native of Europe, escaped from cultivation, 20 to 2500 feet: Coast Ranges; Sierra Nevada foothills. May.

Locs.—Berkeley, *David Goddard* 165 in 1928; Suisun, *Jepson* 16,253a in 1932; Bridgeville, Humboldt Co., *Tracy* 4085 in 1913; Nigger Gulch, Columbia, Tuolumne Co., *Jepson* 6417 in 1915; Alder Creek near Folsom, *Alice King* in 1920; Mono Lake, *Peirson* 7582.

Ref.—VICIA VILLOSA Roth, Tent. Fl. Germ. 2^2:182 (1789), type European.

VICIA ATROPURPUREA Desf. Fl. Atlant. 2:164 (1800), type loc. Algiers. Purple Vetch. Similar to V. villosa; racemes usually looser; pods hairy.—Cultivated from the Old World, sometimes adventive: Hydesville, Humboldt Co., *Tracy* 6701.

2. **V. sativa** L. COMMON VETCH. LENTIL TARE. Stems slender, 1½ to 2¾ feet high; leaflets 6 to 12, glabrous, or the margins slightly ciliate, oblong or narrower, often cuneate, truncate or retuse, mucronate, ⅔ to 1 inch long; stipules small, toothed; flowers solitary or geminate, nearly sessile, the pedicels 1 line long at most; corolla 8 to 10 lines long; banner purple, wings red; calyx-teeth subulate-setaceous, longer than the tube; pods 1½ inches long; seeds 1½ lines in diameter, the hilum extending less than ¼ the distance around the seed.

Naturalized from Europe in fields or edges of thickets, 25 to 1200 feet: mostly near the coast from Humboldt Co. to San Luis Obispo Co.; occasional in the Great Valley and in Southern California. Apr.

Locs.—Eureka, *Tracy* 1202; Scotia, Humboldt Co., *Davy* 5548; St. Helena, *Jepson* 13,612; Glen Ellen, Sonoma Valley, *Jepson* 4190; Italian Bar, Tuolumne Co., *Jepson* 6364; Clements, ne. San Joaquin Co., *Jepson* 1823a; Berkeley, *Davy* 6552; Mission San Jose, *Jepson* 2470; Gilroy, *E. Ferguson* 301; San Luis Obispo Co., *Summers* 213; Los Angeles (Erythea 1:59); San Bernardino, *Parish* 5771.

Refs.—VICIA SATIVA L. Sp. Pl. 736 (1753), type European; Jepson, Fl. W. Mid. Cal. 296 (1901), ed. 2, 237 (1911), Man. 581 (1925).

VICIA FABA L. Sp. Pl. 737 (1753). Broad Bean. Very leafy annual, 1 to 2 feet high; herbage glabrous; tendrils none or rudimentary; flowers 1 to several in the axils; corolla dull white with large purplish spot; pod 2 to 4 inches long or more, 1 inch wide.—Native of Asia, cultivated extensively in California, sometimes a transient escape.

3. **V. hirsuta** S. F. Gray. TINE TARE. Stems several from the annual root, 2 to 3 feet long; herbage subglabrous or hirsutulose; leaves subsessile; leaflets 6 to 22, narrowly linear, 2 to 7 lines long; peduncles filiform, shorter than the leaves; racemes densely 4 to 9-flowered, commonly 3 to 4 lines long; flowers 1½ to 2 lines long; corolla pale blue; pods oblong, 3½ to 6 lines long.

Introduced from Europe, naturalized locally, 20 to 2000 feet: coastal region and Sierra Nevada foothills. May.

Locs.—Eureka, *Tracy* 2513 in 1906, *Peirson* 3630 in 1923; Stitz Creek, betw. South Fork and Scotia, *Tracy* 4689 in 1916; Pine Log, South Fork Stanislaus River, *A. L. Grant* 687; San Francisco, *Alice King* in 1915.

Refs.—VICIA HIRSUTA S. F. Gray, Nat. Arr. Brit. Pl. 2:614 (1821). *Ervum hirsutum* L. Sp. Pl. 738 (1753), type European.

4. **V. tetrasperma** Moench. SLENDER TARE. Stems slender, few from the annual root, 1 to 2 feet long; herbage subglabrous; leaves subsessile; leaflets 4 to 8, linear, 2 to 7 lines long; racemes 1 to 3 (or 4)-flowered, the flowers discrete, the peduncles filiform, equaling or a little shorter than the rachis proper; flowers 2 lines long; corolla purplish and dull white; pods narrowly oblong, 4 to 6 lines long.

Introduced from Europe, locally and sparingly naturalized, 10 to 1000 feet: coastal districts. May-June.

Locs.—Eureka, *Tracy* 3739 in 1912; Manning Creek, Humboldt Co., *M. S. Baker* 92; Stitz Creek, betw. South Fork and Scotia, *Tracy* 4688 in 1916; Mt. Soledad, w. San Diego Co., *Newlon* 286.

Refs.—VICIA TETRASPERMA Moench, Meth. 148 (1794). *Ervum tetraspermum* L. Sp. Pl. 738 (1753), type European.

5. **V. exigua** Nutt. CALIFORNIA VETCH. Stems very slender, 1 to 2 feet high; leaflets 4 to 12, oblong to narrowly linear, acute or obtusish, apiculate, ⅓ to 1¼ inches long; peduncles filiform, shorter than the leaves, ½ to 2 inches long, 1 or 2-flowered; flowers 2 to 3 lines long, white or purplish; pods glabrous, 4 or 5-seeded, 1 inch long, 2 to 3 lines wide; seeds 1 to 1¼ lines in diameter, the hilum very short.

Woods, opens amongst brush, or fields, in stony or sandy soil, 20 to 1500 feet: Coast Ranges from Napa Co. to San Luis Obispo Co.; southward to San Diego Co. Apr.-May.

Locs.—Calistoga, *Tracy* 2097; Clayton, *Chesnut & Drew;* Tracy, *Benj. Cobb;* San Mateo Creek, San Mateo Co., *Davy* 1076; Hadley, San Luis Obispo Co., *Condit;* Santa Cruz Isl., *T. Brandegee;* Santa Monica Cañon, *Barber* 112; Garvanza, Los Angeles, *E. D. Palmer;* San Gabriel River (at mouth of cañon), *Peirson* 2127; San Bernardino, *Parish* 4164; Menifee, Riverside Co., *Alice King;* Fallbrook, San Diego Co., *Abrams* 3339; Witch Creek, San Diego Co., *Alderson.*

Var. **hassei** Jepson. Stouter; leaflets of at least the lower leaves deeply notched at apex, the notch mucronate; pod 5 to 8 or sometimes only 3-seeded.—Coast Ranges from Alameda Co. to San Luis Obispo Co.; coastal Southern California.

Locs.—Oakland, *Chesnut;* Livermore, *Jepson* 13,615; Pacific Grove, *Heller* 6672; Estrella, *Jared;* Santa Monica (Proc. S. Cal. Acad. 1:6); Menifee, *Alice King.*

Refs.—VICIA EXIGUA Nutt.; T. & G. Fl. 1:272 (1838), type from "plains of the Oregon and Upper California", *Nuttall;* Jepson, Fl. W. Mid. Cal. 296 (1901), ed. 2, 237 (1911), Man. 581 (1925). Var. HASSEI Jepson, ll.cc. *V. hassei* Wats. Proc. Am. Acad. 25:129 (1890), type loc. open hills about Los Angeles, *Hasse.*

6. **V. americana** Muhl. AMERICAN VETCH. Stems 2 to 3 feet long, trailing or climbing by branched tendrils, sharply 4-sided or winged at the angles; herbage nearly glabrous; leaflets broadly oblong, usually often widest above the middle, obtuse, mucronulate, ½ to 1¼ inches long; peduncles shorter than the leaves, 4 to 7 or 8-flowered; flowers at first purplish, changing to bluish, 9 lines long; calyx-tube 2 lines long, the lower teeth the longer (1 line long), the upper approximate,

incurved; pods 1¼ to 2 inches long; seeds globose, dull black, 2 lines in diameter, the hilum extending about ¼ way around.

Grassy valleys and open foothills, 50 to 5000 feet: almost throughout cismontane California, only sparingly noted east of the Sierra Nevada in California. East to Virginia and New Brunswick. Feb.-May.

Locs.—Shackelford Creek, head of, near Marble Mt., *Butler* 401; Sisson, Siskiyou Co., *Jepson* 13,604; Fort Bidwell, *Manning* 133; Big Valley, Modoc Co., *Baker & Nutting;* Mineral, Tehama Co., *Jepson* 12,270; Elk River Valley, *Tracy* 2575; Marysville Buttes, *Jepson* 13,607; Blue Cañon, Placer Co., *H. A. Walker* 1216; Panther Creek, Amador Co., *Hansen* 1300; Vacaville, *Jepson* 13,606; Howell Mt., *Tracy* 1617; Columbia, Tuolumne Co., *Jepson* 6283; Mt. Hamilton foothills, *R. J. Smith;* Pacific Grove, *Elmer* 4781; Cuesta Pass, Santa Lucia Mts., *Jepson* 11,964; Bishop Creek, Inyo Co., *Shockley* 421; Tinnemaha Creek, Inyo Co., *Almeda Nordyke;* Los Angeles, *E. D. Palmer;* Palomar Mt., *Jepson* 1509.

The varieties named below are rather marked leaf forms but there are intergrade states from the species to both of them. Indeed, *Jepson* 13,614, Mt. Diablo, exhibits typical leaves of both var. linearis and var. truncata on a single individual.

Var. **linearis** Wats. Leaflets 1 to 1½ inches long, ½ to 1½ lines wide; pods 1 inch long.—General range of the species in California.

Locs.—Big Valley, Modoc Co., *Baker & Nutting;* Hydesville, Humboldt Co., *Tracy* 4482; Byron, *Greene;* Berkeley, *Jepson* 13,605; Mt. Davidson, San Francisco, *Jepson* 10,336; Guadalupe Mine, Los Gatos, *Jepson* 9096; Loma Prieta, *Davy* 638; upper San Benito River, *Jepson* 15,426; San Clemente Isl., *Munz* 6669; Avalon, Santa Catalina Isl., *Geo. B. Grant;* Mesa Grande, San Diego Co., *E. Ferguson* 48.

Var. **truncata** Brew. Leaflets truncate at apex and 3 to 5-denticulate; pods ¾ to 1 inch long.—General range of the species in California.

Locs.—Goose Lake, Modoc Co., *Austin & Bruce;* Redding, *Heller* 7874; Browns Creek, Trinity Co., *H. S. Yates* 369; Quincy, *Heller* 10,857; Armstrong sta., Amador Co., *Hansen* 1366; Sherwood Valley, Mendocino Co., *Jepson* 1830; Ukiah, *Davy* 5024; Oakville, Napa Valley, *Jepson* 13,609; Montezuma Hills, se. Solano Co., *Jepson* 13,610; Murphys, Calaveras Co., *Davy;* Columbia, Tuolumne Co., *A. L. Grant* 693; Rosasco, Tuolumne Co., *Chesnut & Drew;* Ross Valley, Marin Co., *Jepson* 13,637; Berkeley, *Jepson* 13,639; Mt. Diablo, *Jepson* 13,638; Palo Alto, *Tidestrom;* Mt. Hamilton, *R. J. Smith;* Loma Prieta, *Davy* 539; San Luis Obispo, *Summers;* Elizabeth Lake, Los Angeles Co., *Parish* 1914; San Dimas Cañon, San Gabriel Mts., *Peirson* 2396; Mesa Grande, San Diego Co., *E. Ferguson* 63; Witch Creek, San Diego Co., *Alderson.*

Refs.—Vicia americana Muhl.; Willd. Sp. Pl. 3:1096 (1800), type loc. Pennsylvania; Jepson, Fl. W. Mid. Cal. 296 (1901), ed. 2, 237 (1911), Man. 581, fig. 575 (1925). *V. copelandii* Eastw. Bull. Torr. Club 32:197 (1905), type loc. Sisson, *Copeland.* Var. linearis Wats. Proc. Am. Acad. 11:134 (1876); Jepson, ll.cc., Man. 581, fig. 576. *Lathyrus linearis* Nutt.; T. & G. Fl. 1:276 (1838), type loc. "plains of the Platte" [River], *Nuttall.* Var. truncata Brew.; B. & W. Bot. Cal. 1:158 (1876); Jepson, Fl. W. Mid. Cal. 297 (1901), ed. 2, 237 (1911), Man. 582, fig. 577 (1925). *V. truncata* Nutt.; T. & G. Fl. 1:270 (1838), type loc. "plains of the Oregon" [Columbia River], *Nuttall.* *V. pumila* Hel. Muhl. 2:88 (1905), type loc. betw. Upper Soda Spring and Shasta Retreat, *Heller* 7938.

7. **V. californica** Greene. Sierra Vetch. Stems zigzag, erect or decumbent, 5 to 11 inches long; herbage finely villous-pubescent; leaflets 8 to 12, elliptic to cuneate-obovate, truncate with the apex 3 to 5-denticulate, 3 to 8 lines long; racemes 3 to 6-flowered; flowers 6 to 7 lines long.

Openly wooded mountain slopes, 2200 to 6000 feet: mountains of coastal Southern California; Sierra Nevada from Kern Co. to Siskiyou Co., thence south in the Coast Ranges to Humboldt Co. May-July.

Biol. note.—This plant is very closely related to Vicia americana var. truncata Brew. Its leaflets are shaped much the same but are subcoriaceous and have often a somewhat bluish cast; the tendrils are short and simple; the plants are usually very low. Each side of the keel near the tip bears a strongly marked somewhat inflated fold; these folds and the tip are blue-purple, the rest of the keel white or whitish. If it were made a variety of V. americana, Kellogg's varietal name would be used.

Sometimes this plant is found growing in leaf mold beneath Quercus kelloggii trees. In such a situation we have found it exhibiting interesting biological peculiarities as at Chowchilla School in the Mariposa Co. foothills (*Jepson* 12,796). The root-crown, somewhat deep-seated, bears erect filiform stems which give rise to the aerial shoots. About the time of flowering the root-crown also sends out horizontal rootstocks which are slenderly fusiform-thickened or somewhat cylindric-fleshy at irregular intervals. The root-tip of these structures is recurved at the very end, so that, advancing through the soil, it presents a blunt surface.

Locs.—S. Cal.: Cuyamaca Mts. (Dav. & Mox. Fl. S. Cal. 192); Santiago Peak (Dav. & Mox. Fl. S. Cal. 192). Sierra Nevada: Tehachapi Valley, *Coville & Funston* 1120; Colony Mill to Giant Forest, *Jepson* 667; Millwood, Fresno Co., *Jepson* 2786; Eight-mile sta., near Wawona, *Jepson* 4291; Alder Creek, Yosemite, *Jepson* 4325; Hodgdon Ranch, Tuolumne Big Trees, *Jepson* 10,544; Hazel Green, Mariposa Co., *Jepson* 13,613; Avery, Calaveras Co., *Tracy* 5748; Savage Hill, Amador Co., *Hansen* 343; Camino, 7 mi. above Placerville, *K. Brandegee;* Mineral, Tehama Co., *J. Grinnell;* Forestdale, sw. Modoc Co., *M. S. Baker.* North Coast Ranges: Trinity Summit, *Manning* 62; Greenhorn Mt., Siskiyou Co., *Butler* 604; Humbug Mt., Siskiyou Co., *Butler;* East Fork Illinois River, Siskiyou Mts., *Jepson* 2943.

Var. madrensis Jepson var. n. Leaflets strongly serrate above the base.—(Foliola serrata supra basin).—North Fork, Madera Co., *Ralph Noddin* (type).

Refs.—VICIA CALIFORNICA Greene, Fl. Fr. 3 (1891), type loc. Calaveras Co., *Greene;* Jepson, Man. 582 (1925). *V. durbrowii* Eastw. Bull. Torr. Club 32:196 (1905), type loc. Wawona, *Eastwood. V. truncata* var. *villosa* Kell. Proc. Cal. Acad. 1:57 (1855), type loc. Placerville. Var. MADRENSIS Jepson.

8. **V. gigantea** Hook. GIANT VETCH. Stems stout, somewhat pubescent, climbing several feet high, often forming extensive tangles and draperies over shrubs; leaflets narrowly oblong or tapering somewhat from the base to the obtuse mucronulate apex; racemes 1¼ to 2 inches long; calyx short, lower teeth about equaling the tube; corolla red-purple or pale saffron, 6 to 7 lines long; pods oblong, 1½ inches long, glabrous, glaucous, 3 or 4-seeded; seeds globose, velvety black, 2 lines in diameter, more than halfway encircled by the hilum.

Along streams, 10 to 500 feet: near the coast from northwestern San Luis Obispo Co. to Humboldt Co. North to Alaska. Mar.-June. The herbage blackens in drying.

Locs.—San Carpoforo, n. San Luis Obispo Co., *Condit;* Plasketts, Monterey Co., *K. Brandegee;* Carmel, *Parish* 11,548; Pescadero, San Mateo Co., *Elmer* 4445; Lobos Creek, San Francisco, *Eastwood;* Berkeley, *Jepson* 6226; Duncans Mills, Sonoma Co., *Davy* 1649; Hubbard sta., Humboldt Co., *Davy* 5434; Petrolia, Humboldt Co., *Jepson* 13,640; Eureka, *Tracy* 2986.

Refs.—VICIA GIGANTEA Hook. Fl. Bor. Am. 1:157 (1839), type loc. open woods on the Columbia River, *Scouler, Douglas;* Jepson, Fl. W. Mid. Cal. 297 (1901), ed. 2, 237 (1911), Man. 582, fig. 578 (1925). *Lathyrus cinctus* Wats. Proc. Am. Acad. 23:263 (1889), type loc. "Jolon", Monterey Co., *T. Brandegee;* the real station is, perhaps, Plaskett's ranch on the coast.

9. **V. cracca** L. BIRD VETCH. Stems 3 to 4 feet high, striate-angled; herbage puberulent; leaflets 16 to 24, linear, approximate, ¾ to 1¼ inches long; racemes equaling or surpassing the leaves, densely 9 to 12-flowered, 1¼ to 1¾ inches long; corolla bright blue-purple, 5 lines long; pods ¾ inch long, glaucescent, few-seeded; seeds dull black, 1¼ lines in diameter, nearly half encircled by the hilum.

Fields, 4000 to 5000 feet: native of northeastern United States and of Europe, naturalized in northern Modoc Co. Also in southeastern Oregon. July.

Locs.—Goose Lake, Modoc Co., *Austin & Bruce* 2220; Davis Creek, Modoc Co., *R. M. Austin;* Ft. Bidwell, *Manning.*

Refs.—VICIA CRACCA L. Sp. Pl. 735 (1753), type from Europe. *V. semicincta* Greene, Erythea 3:17 (1895), type loc. Crane Creek, se. Ore., *R. M. Austin;* Erythea 4:56 (1896); Jepson, Man. 582 (1925).

28. **LATHYRUS** L. PEA

Herbs, ours perennial. In technical character and in habit very similar to Vicia. Raceme commonly one-sided. Flowers commonly larger and more showy. Banner roundish or very broad. Calyx-teeth very unequal, the three lower longer, the two upper much reduced. Leaflets usually larger, in ours 3 to 5 pairs, mostly mucronate; rachis in some species not prolonged into a tendril. Style flattish, hairy along the upper side only, that is, next the free stamen.—Species about 100, mostly northern hemisphere, all continents except Australia. (Old Greek name of the pea.)

Bibliog.—Watson, S., North American species of [Lathyrus] (Proc. Am. Acad. 11:133–134, —1876). White, T. G., Preliminary revision of the genus Lathyrus in North and Central America (Bull. Torr. Club 21:444–458,—1894). Fernald, M. L., Variations of Lathyrus palustris (Rhod. 13:47–52,—1911). Piper, C. V., Some western species of Lathyrus (Proc. Biol. Soc. Wash. 31:189–196,—1918). Bradshaw, R. V., Pacific Coast species of Lathyrus (Bot. Gaz. 80:233–261, figs. 1–29,—1925).

Stems angled.
Tendrils unbranched or none.
Herbage villous.
Plants decumbent; stipules larger than the leaflets; tendrils none; peduncles longer than the leaves, 2 to 6-flowered........1. *L. littoralis.*
Plants erect; stipules smaller than the leaflets; tendrils none or reduced to a point; peduncles much shorter than the leaves, 1 or 2-flowered........2. *L. torreyi.*
Herbage glabrous or pubescent.
Leaflets thin, the mucro minute; tendrils usually simple; herbage puberulent........3. *L. nevadensis.*
Leaflets thick, coriaceous, glaucous, the mucro stout and twisted; tendrils none or reduced to a point; herbage glabrous........4. *L. rigidus.*
Tendrils long, branched or simple (or minute in var. of no. 5).
Peduncles not exceeding leaves, usually much shorter; leaflets (in ours) linear to linear-lanceolate, much exceeding the rachis........5. *L. lanszwertii.*
Peduncles nearly equaling to much exceeding the leaves; leaflets various, never exceeding the rachis.
Herbage more or less pubescent; stipules ¼ to ¾ inch long.
Flowers 12 to 15 lines long, deep red; banner usually completely reflexed........6. *L. splendens.*
Flowers 7 to 11 (rarely to 15) lines long or less, the colors variable; banner rarely completely reflexed.
Lower sinus of calyx wide, the lateral teeth lanceolate to subulate; corolla rose-pink or flesh-color (the banner with purple veinlets), or sometimes red........7. *L. laetiflorus.*
Lower sinus of calyx narrow, the lateral teeth ovate or lanceolate-oblong; corolla dull white, the banner purple-veined or purplish........8. *L. bolanderi.*
Herbage glabrous; stipules ¾ to 1¾ inches long.
Ovary glabrous; tendrils branched; stipules small or large, not resembling the leaflets.
Flowers 7 to 10 lines long; corolla not turning sordid.
Leaflets 6 to 12, usually coriaceous; racemes 3 to 8-flowered; calyx-teeth glabrous........9. *L. pauciflorus.*
Leaflets 10 to 20, not coriaceous; racemes stout, 5 to 10-flowered; calyx-teeth ciliate........10. *L. polyphyllus.*
Flowers 5 to 6 lines long; racemes slender, 7 to 19-flowered; corolla turning sordid........11. *L. sulphureus.*
Ovary pubescent; tendrils mostly unbranched; stipules as large as and simulating the leaflets........12. *L. maritimus.*
Stems winged; tendrils long, branched.
Leaflets 2 to 6; racemes 2 to 6-flowered; herbage glabrous or puberulent........13. *L. palustris.*
Leaflets 8 to 12; racemes 6 to 15-flowered.
Herbage puberulent; stipules ¼ to ¾ inch long........14. *L. watsonii.*
Herbage glabrous or nearly so; stipules ½ to 1¾ inches long........15. *L. jepsonii.*

1. **L. littoralis** Endl. Beach Pea. Stems many from creeping rootstocks, decumbent, 6 to 15 inches long; herbage densely silky-villous, suggestive of a hairy Lupine; leaflets 1 to 3 pairs with a usually smaller or imperfect terminal one, cuneate-oblong, 4 to 6 lines long; stipules ovate or somewhat hastate, 1½ to 2 times as large as the leaflets; peduncles exceeding the leaves; calyx-teeth nearly equal, as long as the tube; corolla 6 to 8 lines long; banner purple, the keel and wings white or nearly so; pods oblong, 1 inch long, villous, 3 to 5-seeded.

Seabeaches and sand dunes: Monterey Co. to Humboldt Co. North to Washington. Apr.-Oct.

Locs.—Monterey, acc. *W. S. Cooper;* Natural Bridge, Santa Cruz Co., *Anderson;* Moss Beach, near Halfmoon Bay, *K. Brandegee;* San Francisco, *Jepson* 2638, 10,242; Humboldt Bay, *Tracy* 2451.

Refs.—LATHYRUS LITTORALIS Endl.; Walp. Rep. 1:722 (1842); Jepson, Fl. W. Mid. Cal. 298 (1901), ed. 2, 238 (1911), Man. 583, fig. 579 (1925). *Astrophia littoralis* Nutt.; T. & G. Fl. 1:278 (1838), type loc. "sand hills near the estuary of the Oregon," *Nuttall*. *Orobus littoralis* Gray, Pac. R. Rep. 4:77 (1857).

2. **L. torreyi** Gray. REDWOOD PEA. Stems erect, very slender, 4 to 9 inches high; herbage light green, sparingly villous; leaflets thin, elliptic to ovate or oblong, 5 to 7 lines long; leaves with a terminal leaflet or the rachis merely ending in a point; stipules small, semi-sagittate, lanceolate, the lower lobe very short; flowers solitary or in 2s, the peduncles 4 to 12 lines long; calyx-teeth subulate, exceeding the tube, or the upper shorter and broader; corolla 6 lines long; banner pale lilac, keel and wings white; pods linear-oblong, pubescent, 1 inch long, 3 to 5-seeded.

Shady woods, 50 to 1500 feet: Santa Clara Co. to Humboldt Co. North to Washington. May-June.

Habit note.—Lathyrus torreyi often forms small but pure colonies of even growth about 6 inches high on wooded banks, as at Mt. Hermon in the Santa Cruz Mts. It has a marked appearance on account of its delicate habit, light green foliage and usually 1-flowered racemes. A distinctive character resides in the foliage which possesses a lasting fragrance. The corolla is sometimes violet-tinted.

Locs.—Gilroy, *Chas. Palache;* Ross Valley, *M. S. Baker;* Guerneville, *Congdon;* Calistoga (sw. of), *Jepson* 13,626; Comptche, *H. A. Walker* 271; Cahto, Mendocino Co., *Jepson* 1862; Ft. Bragg, *Mathews;* Bull Creek, Humboldt Co., *Jepson* 16,456; Redwood House to Yager, Humboldt Co., *M. S. Baker* 57; Acorn n. Humboldt Co., *Jepson* 1937; Kneeland, *Chesnut & Drew;* Trinity Summit, *Manning* 62½.

Refs.—LATHYRUS TORREYI Gray, Proc. Am. Acad. 7:337 (1868), type loc. stated as "Mendocino or s. part of Humboldt Co.", actually Shelter Cove, *Bolander* 6506; Jepson, Fl. W. Mid. Cal. 297 (1901), ed. 2, 238 (1911), Man. 583 (1925).

3. **L. nevadensis** Wats. SIERRA PEA. Stems few from the slenderly branched root-crown, mostly simple, disposed to be naked or few-leaved below, 5 to 18 inches high; herbage sparsely soft-puberulent to subglabrous; leaflets 3 to 6 pairs, narrowly or broadly elliptic, acute or obtuse at both ends, apiculate or mucronulate, usually rather thin, sometimes small and thick, ¾ to 1¾ inches long; stipules 3 to 8 lines long; tendrils commonly short and unbranched; peduncles usually shorter than the leaves, few (2 to 4, rarely 6)-flowered; calyx-tube 2½ lines long, its teeth triangular-acuminate, the lower somewhat the larger, about ½ length of tube; corolla rose-pink or crimson to reddish-purple, fading blue, sometimes yellowish-white, 6 to 10 lines long; keel abruptly upward-turned or right-angled.

Wooded or brushy slopes, 1500 to 7000 feet: Sierra Nevada from Fresno Co. to Tehama Co.; North Coast Ranges from Napa Co. to Siskiyou Co. Apr.-May.

Locs.—Sierra Nevada: Fresno Co., *Mainwaring;* Eight-mile sta., near Wawona, *Jepson* 4290; Yankee Hill, Tuolumne Co., *A. L. Grant* 652; Calaveras Big Trees, *A. L. Grant;* Forest Hill, Placer Co., *Bolander* 4629; Battle Creek Mdw., Tehama Co., *Jepson* 12,266. North Coast Ranges: Howell Mt., *Tracy* 1527; South Yager Creek Valley, Humboldt Co., *Tracy* 6062; Willow Creek Cañon, Humboldt Co., *Tracy* 7444; South Fork Mt., Trinity Co., *Jepson* 16,664; Cuddihy Valley, w. Siskiyou Co., *Jepson* 2853; Goosenest foothills, e. Siskiyou Co., *Butler*.

Tax. note.—Lathyrus nuttallii Wats. Proc. Am. Acad. 21:450,—1886, based entirely on plants from Idaho and Oregon ("upper California", *Nuttall*) to British Columbia, is segregated according to Bradshaw (Bot. Gaz. 80:242–243) from L. nevadensis Wats. by the following characters: L. nuttallii, tendrils well developed; leaflets 6 to 14, usually 8; racemes 4 to 6-flowered; corollas 6 to 8 lines long; calyx-teeth less than half as long as the tube. L. nevadensis, tendrils mostly obsolete; leaflets 4 to 8, usually 6; racemes 2 to 3-flowered; corollas 10 lines long; calyx-teeth over half as long as tube. Using these criteria in succession, a different grouping of the California plants results each time. Individual plants often vary so as to agree in great part with both descriptions. Plants agreeing in all respects with one or the other description are much less numerous than those in some respects intermediate. In California the ranges of plants varying toward either of these forms are not distinct but coincident.

Refs.—LATHYRUS NEVADENSIS Wats. Proc. Am. Acad. 11:133 (1876); Jepson, Man. 583 (1925). *L. venosus* var. *obovatus* Torr. Pac. R. Rep. 4:77 (1857), based on plants from near

Calaveras Big Trees, *Bigelow*, and Duffield ranch, Tuolumne Co., *Bigelow*, in part. *Vicia nana* Kell. Proc. Cal. Acad. 7:89 (1876), type loc. Granite Mt., Oak Creek, Kern Co., *Brannan*. *L. obovatus* White, Bull. Torr. Club 21:455 (1894). *L. nuttallii* Wats. l.c. 21:450 (1886), type loc. "upper California" [Columbia River], *Nuttall*. *L. nevadensis* subsp. *stipulaceus* Bradshaw, Bot. Gaz. 80:244 (1925); stipules larger, ⅓ to ½ size of the leaflets; racemes as much as 10-flowered.—British Columbia to California (Eldorado Co.). *L. obovatus* var. *stipulaceus* White, Bull. Torr. Club 21:455 (1894), type loc. between Colville and Spokane, Wash., Wilkes Exp. no. 592.

4. **L. rigidus** White. Modoc Pea. Stems many from the heavy crown of a stout taproot, slender, angled, erect or ascending, forming a thick tuft 6 to 10 inches high; herbage glabrous and somewhat glaucous; stipules narrow; leaves coriaceous, 1 to 2½ inches long; leaflets 4 to 10, oblong-oblanceolate, cuspidate, 7 to 11 lines long; tendrils reduced or none; peduncles exceeding the leaves; racemes 2 to 5-flowered; corolla white, 8 to 11 lines long.

Valleys, 2500 to 4000 feet: northeastern Modoc Co. North to eastern Oregon. May-July.

Locs.—Goose Lake, *Austin & Bruce* 2220; Fort Bidwell, *Manning* 19. Se. Ore.: Pine Creek, *R. M. Austin*.

Refs.—Lathyrus rigidus White, Bull. Torr. Club 21:455 (1894); Jepson, Man. 584 (1925). *L. albus* Wats. Bot. Cal. 2:442 (1880), type loc. Surprise Valley, Modoc Co., *Lemmon;* not L. albus Garcke (1849).

5. **L. lanszwertii** Kell. var. **aridus** Jepson comb. n. Mountain Pea. Stems erect or climbing, 1 to 1½ feet high, usually not branching; herbage puberulent; rachis of leaves 2 to 3 inches long; leaflets 6 to 12, firm, linear-lanceolate, ½ to 1¾ lines wide, 1 to 2¼ inches long; tendrils simple or branched; stipules narrow, lanceolate or falciform, 2 to 5 lines long; peduncles not exceeding rachis, usually much shorter, 2 to 7-flowered (in ours); calyx-teeth unequal, shorter than the tube; corolla 4 to 8 lines long; keel and wings white, the banner pink with a fine mesh of darker veins; pods glabrous, 1¼ to 1¾ inches long.

Openly wooded mountain slopes, 3500 to 6500 feet: Sierra Nevada from Mariposa Co. to Modoc Co. North to Oregon. June-July.

Locs.—Hodgdon Ranch, near Tuolumne Big Trees, *Jepson* 10,558; Strawberry sta., Tuolumne Co., *A. L. Grant* 93; Fallen Leaf Lake, Placer Co., *M. S. Baker;* Fall River Mts., se. Modoc Co., *M. S. Baker*.

Tax. note.—Specimens from the region between Washoe and Franktown, Nevada (*Heller* 10,594) have been taken as representative of L. lanszwertii Kell. If this be a proper reference, as seems probable, then we regard these plants with broad leaflets and with somewhat crowded racemes as more or less distinct from the plants of the Sierra Nevada with narrow leaflets. Part of this Sierran form with narrow leaflets Bradshaw (Bot. Gaz. 80:246) calls L. lanszwertii, part L. lanszwertii subsp. aridus (l.c. 80:247). The latter he characterizes as having 2 to 4-flowered racemes and smaller flowers (usually about 5 lines long), characters which fall within the range of characters of his typical L. lanszwertii. *Austin* 29 (Quincy, Plumas Co.) is cited by Bradshaw as L. lanszwertii (Bot. Gaz. 80:247). The two individuals on the sheet have both few-flowered racemes but differ a little in flower size, one answering to L. lanszwertii Bradshaw, and the other to the subsp. aridus Bradshaw. They are, however, apparently quite alike in all other features, and this slight range in flower size (which is admitted for his species) does not seem to be very important for distinguishing a subspecies. Other spms. cited by Bradshaw as subsp. aridus do not have "minute tendrils" but rather large or even branched ones. The whole of this narrow-leaved group of the Sierra Nevada and northward with non-glabrous herbage we regard as one form and as distinct, at least varietally, from the true L. lanszwertii Kell. of western Nevada. L. graminifolius White (Bull. Torr. Club 21:454,—1894) of Arizona, New Mexico and Mexico, differs slightly from var. aridus in glabrous or more nearly glabrous herbage and in having on the average longer peduncles (L. palustris var. graminifolius Wats. Proc. Am. Acad. 23:263,—1888, "New Mexico to Arizona and northern Mexico"; Sonora, Mex., *Thurber* 1016).

Var. **brownii** Jepson comb. n. Herbage glabrous; leaflets usually 2 to 6, linear to linear-lanceolate, 1 to 3½ inches long; tendrils sometimes obsolete; raceme 1 to 4-flowered.—Mendocino Co. to Siskiyou Co.; Lassen Co. to Nevada Co.; Kern Co. North to Oregon. Resemblance between this variety and L. pauciflorus Fer. is not obvious. Stipules, calyx-teeth and the abruptly upflexed keel are all more reminiscent of L. lanszwertii var. aridus.

Locs.—Potter Valley, Mendocino Co., *Purpus;* Trinity River near South Fork, *Tracy* 7432; Hayfork, Trinity Co., *Blasdale;* Greenhorn Mt., e. Siskiyou Co., *Butler* 1346; Black Butte, near Mt. Shasta, *Heller* 14,378; Goose Valley, Modoc Co., *M. S. Baker;* Susanville, *T. Brandegee;* Nevada Co. (Bot. Gaz. 80:251); Tehachapi Mts. (Bot. Gaz. 80:251).

Refs.—LATHYRUS LANSZWERTII Kell. Proc. Cal. Acad. 2:150 (1863), type loc. Washoe, Nev., *Lanszweert.* Var. ARIDUS Jepson. *L. lanszwertii* subsp. *aridus* Bradshaw, Bot. Gaz. 80:247 (1925). *L. coriaceus* subsp. *aridus* Piper, Proc. Biol. Soc. Wash. 31:190 (1918), type loc. Black Butte, Crook Co., Ore., *Cusick* 2814. *L. oregonensis* White, Bull. Torr. Club 21:456 (1894), type from Ore., *Cusick* 1372. *L. goldsteinae* Eastw. Bull. Torr. Club 32:197 (1905), type loc. Lakeside Park, Lake Tahoe, *Lutie Goldstein.* *L. graminifolius* Jepson, Man. 584 (1925) in part, not White. Var. BROWNII Jepson. *L. brownii* Eastw. Bull. Torr. Club 30:491 (1903), type loc. n. side Mt. Shasta, *H. E. Brown* 391. *L. pauciflorus* subsp. *brownii* Piper, Proc. Biol. Soc. Wash. 31:195 (1918). *L. graminifolius* Jepson, Man. 584 (1925) in part, not White.

6. **L. splendens** Kell. Campo Pea. Stems climbing bushes 2 to 4 feet high, angled; herbage minutely pubescent or subglabrous; leaflets about 8, linear to elliptic-ovate, very variable (even on one individual), 10 to 14 lines long; stipules variable; racemes 4 to many-flowered; corolla deep red, changing to dark purple, finally sordid, 1 to 1¼ inches long.

Valley flats and mountain slopes, 50 to 3350 feet: San Diego Co. South to Lower California. Apr.

Note on variation.—The two forms, Lathyrus splendens Kell. and L. laetiflorus var. alefeldii Jepson, are apparently closely related. The red-flowered phase of this latter form is not uncommon and it also exhibits at times the extreme deflexing of the banner which is characteristic of L. splendens.

Locs.—Pauma Wash, Pala Mission, *Jepson* 8489; Mt. Soledad, w. San Diego, *Newlon* 285; La Jolla, *Jepson* 11,869; Mesa Grande, *E. Ferguson* 15; Buckman Sprs., *Parish* 9085.

Refs.—LATHYRUS SPLENDENS Kell. Proc. Cal. Acad. 7:90 (1876), type from S. Cal., *J. M. Hutchings;* Jepson, Man. 584 (1925). *L. vestitus* Wats.; B. & W. Bot. Cal. 2:442 (1880); not Nutt. (1838).

7. **L. laetiflorus** Greene. Cañon Pea. Stems stout, climbing, several feet long; herbage pubescent or glabrous; stipules usually small (2 to 5 lines long); leaflets firm, venulose, elliptic-oblong to linear or ovate, ½ to 2½ inches long; tendrils well developed, branched; peduncles stoutish, exceeding the leaves; racemes lax, 5 to 12-flowered; flowers 9 to 11 lines long; calyx-teeth unequal, separated by wide sinuses, the lateral subulate or linear-lanceolate, the lower linear, usually shorter than the tube, sometimes as long; corolla rose-pink or flesh color, or whitish with red, purple or lavender veinlets; pods slightly pubescent; seeds 4 to 8.

Foothill mesas and mountains, 2000 to 5500 feet: San Gabriel and San Bernardino mountains to San Diego Co. South to Lower California. Mar.-June.

Geog. note.—The two groups, Lathyrus bolanderi Wats. and L. laetiflorus Greene, have been somewhat indefinitely distinguished. Typically, the southern California group, L. laetiflorus, has lanceolate-subulate lateral calyx-teeth with wide sinuses between these and the very narrow lower tooth. Although in the type specimen the calyx-teeth are longer than the tube, they are usually shorter. The flowers average larger than in northern California plants, the racemes are usually fewer flowered and lax, with much elongated peduncles. This divergence culminates in the variety alefeldii, which is farthest removed geographically from the northern plants. The central and northern California group, L. bolanderi and the more pubescent variety violaceus, have typically lanceolate-oblong lateral calyx-teeth with a narrow U to V-shaped sinus between these and the lower tooth which is usually broader than in the Southern California forms. The calyx-teeth are usually longer than the tube, nearly always at least equal to it. The flowers average smaller than in the L. laetiflorus group. The racemes in L. bolanderi are in general denser with more numerous flowers and with the peduncles less elongated. Plants from Monterey, San Luis Obispo and Santa Barbara counties show a much less typical condition and occasionally a plant with the characteristic calyx of L. laetiflorus occurs. The ranges of the two groups overlap in this region and the racial strains perhaps hybridize. We cite stations for L. laetiflorus as below.

Locs.—Tujunga Cañon, San Gabriel Mts., *Peirson* 2137 (leaflets narrow); Arroyo Seco, San Gabriel Mts., *Peirson* 104; Pacoima Cañon, San Gabriel Mts., *Peirson* 374; Claremont, *C. F. Baker* 4186; Santa Catalina Isl., *K. Brandegee;* San Bernardino, *Parish;* Strawberry Valley, Mt. San Jacinto, *Jepson* 1279; Vandeventer, Santa Rosa Mts., *Jepson* 1423; Silverado Cañon, Orange Co., *Peirson;* Palomar Mt., *Jepson* 1564; Moro hills near Fallbrook, San Diego Co., *Abrams* 3310; Warner Ranch, San Diego Co., *Hall* 9427 (a variant with long narrow leaves corresponding to var. barbarae in the bolanderi group, and, except for narrower stipules, probably similar to the type of L. strictus Nutt.).

Var. **alefeldii** Jepson comb. n. Stipules larger, sometimes nearly half as large as the leaflets; flowers larger, 10 to 15 lines long, red, purple or blue.—San Gabriel Mts. to San Diego Co.

Locs.—Claremont, Los Angeles Co., *Chandler;* Palomar Mt., *Parish* 4402; Fallbrook, San Diego Co., *Cleveland;* Witch Creek, San Diego Co., *Alderson.* The segregation of this variety is not always satisfactory since the larger-flowered forms do not always have larger stipules. It is usually found with the species but is more common in San Diego Co. (Erythea 6:88). Feb.-June.

Refs.—LATHYRUS LAETIFLORUS Greene, Erythea 1:105 (1893), type from Los Angeles Co., cult. at University of California Botanic Garden. *L. strictus* Nutt.; T. & G. Fl. 1:276 (1838), type loc. "bushy places", San Diego, *Nuttall;* Jepson, Man. 584 (1925); not L. strictus Grauer (1784). *L. venosus* var. *grandiflorus* Torr. Pac. R. Rep. 4:77 (1857), type loc. Cucamonga ("Cocomungo"), *Bigelow,* is we believe, L. laetiflorus and not L. splendens. The latter has never been collected in the Cucamonga region, so far as our records show. By "the ordinary form", Torrey undoubtedly meant the familiar eastern L. venosus Muhl. *L. strictus* var. *thacherae* Jepson, Man. 584 (1925), type loc. Ojai Valley, Ventura Co., *Olive Thacher* 22. Var. ALEFELDII Jepson. *L. alefeldii* White, Bull. Torr. Club 21:449 (1894), resting on *Orobus californica* Alef. Bonplandia 9:146 (1861), excl. synonyms, type loc. San Diego, *Thurber* 574; not L. californicus Dougl. (1828). *L. strictus* var. *alefeldii* Jepson, Man. 584 (1925). *L. laetiflorus* subsp. *alefeldii* Bradshaw, Bot. Gaz. 80:261 (1925).

8. **L. bolanderi** Wats. HILLSIDE PEA. Stems angled, low and herbaceous, or climbing 3 to 7 feet high on shrubs and woody below; herbage glabrous or finely puberulent; leaflets narrowly elliptic to ovate, usually more acute at apex than base, mucronulate, dark green, lighter below, ¾ to 1¾ inches long; stipules broadly or narrowly semi-sagittate; racemes many-flowered; lowest calyx-tooth lanceolate, 1¼ to 2 times as long as the tube; corolla dull white, turning sordid in age, 7 to 9 lines long, the banner violet-veined, sometimes pink-tinged; seed with a small aril.

Open or brushy slopes in the hills, 50 to 2500 feet: Santa Barbara Co. and the Tehachapi Mts. to Humboldt Co. North to Oregon. Mar.-June.

Locs.—San Miguelito Cañon, Lompoc, *Munz* 10,279; Rowen, Tehachapi Mts., *Jepson* 6744; San Luis Mt., *Summers* 216; Kings Mt., San Mateo Co., *C. F. Baker* 240; Mt. Davidson, San Francisco, *Jepson* 10,337a; Berkeley, *Jepson* 7189; Pt. Isabel, *Davy;* Ross Valley, Marin Co., *Jepson* 13,627; Cazadero, *Congdon;* St. Helena, *Jepson* 13,636; Hydesville, *Tracy* 3610; Buck Mt., Van Duzen River, *Tracy* 4352; Humboldt Hill, *Tracy* 2498.

The stipules are highly variable in size, shape and margin, and do not vary consistently with any other character. Sometimes this species, especially near the coast, exhibits broad stipules and glabrous or nearly glabrous herbage, sometimes broad stipules and pubescent herbage, sometimes narrow stipules and subglabrous herbage, in any case with either few or many-flowered racemes, and so by many intergrades passing into the following rather indefinite variety.

Var. **violaceus** Jepson comb. n. Herbage pubescent; stipules narrow; flowers sometimes fewer.—Mendocino Co. to Los Angeles Co.: South Mill Creek, Ukiah, *Jepson* 9250; Mt. St. Helena, *Jepson* 10,370; Howell Mt., *Jepson* 531; Mt. Diablo, *Jepson* 10,692; Loma Prieta, *Davy* 540; Monterey, *Jepson* 2995; Sycamore Cañon, Santa Inez Mts., *Jepson* 9149 (stipules large).

Var. **quercetorum** Jepson comb. n. Plants typically low, the stems erect; pubescence whitish; corolla tawny.—Inner South Coast Range from Contra Costa Co. to Santa Clara Co.: Mt. Diablo, *Brewer;* Mt. Day, *R. J. Smith;* Mt. Hamilton, *Greene.*

Var. **tracyi** Jepson comb. n. Stems erect, about 1½ feet high; herbage glabrous, the leaflets beneath scantily puberulent; stipules rather narrow, the lower lobe curved; peduncles about equaling the leaves; racemes 10 to 11-flowered, ¾ to 1 inch long, the flowers crowded, 5 to 5½ lines long; calyx-teeth not exceeding tube; corollas yellow or cream-color.—Brushy slopes, 3000 feet: Grouse Mt., Humboldt Co.

Var. **barbarae** Jepson comb. n. Leaves narrowly linear to linear-lanceolate.—Monterey Co. (Little Sur River, *Davy* 7379) and San Luis Obispo Co. (San Carpojoro, *Condit*) to Santa Barbara Co.

Refs.—LATHYRUS BOLANDERI Wats. Proc. Am. Acad. 20:363 (1885), type loc. Oakland Hills, *Bolander, Torrey;* Jepson, Fl. W. Mid. Cal. 298 (1901), ed. 2, 239 (1911). *L. puberulus* White; Greene, Man. Reg. S. F. Bay 85 (1894), type loc. Sonoma Co., in part. *L. vestitus* var. *puberulus* Jepson, Fl. W. Mid. Cal. 298 (1901), ed. 2, 238 (1911). *L. vestitus* Jepson, Man. 584 (1925), not Nutt. (1838). Var. VIOLACEUS Jepson. *L. violaceus* Greene, Erythea 1:105 (1893), type grown at Berkeley from seed brought from the mountains of Los Angeles Co. *L. bolanderi* subsp. *violaceus* Bradshaw, Bot. Gaz. 80:253 (1925). Var. QUERCETORUM Jepson. *L. quercetorum* Hel. Muhl. 2:290 (1907), type loc. Mt. Hamilton, *Heller* 8623. *L. bolanderi* subsp. *quercetorum* Bradshaw, Bot. Gaz. 80:253 (1925). Var. TRACYI Jepson. *L. tracyi* Bradshaw, Bot. Gaz. 80:245 (1925), type loc. Janes ranch, Grouse Mt., Humboldt Co., *Tracy* 4943. Var. BARBARAE Jepson. *L. violaceus* var. *barbarae* White, Bull. Torr. Club 21:452 (1894), type loc. Santa Barbara, *Wheelock*. *L. strictus* var. *barbarae* Jepson, Man. 584 (1925).

9. **L. pauciflorus.** Fer. BRUSH PEA. Stems erect or climbing, 1 to 2 feet high; herbage perfectly glabrous; leaflets 6 to 12, elliptic to ovate-lanceolate, usually firm, ½ to 1½ (or 2) inches long; tendrils various; stipules ⅓ to ½ the size of the leaflets, semi-sagittate; peduncles longer or shorter than the rachis; racemes usually 3 to 8-flowered; calyx-teeth narrow, not ciliate, not exceeding tube; corolla purple, 9 to 10 lines long; pods glabrous, 1¼ to 2⅓ inches long, usually 3½ to 4 lines wide.

Brushy or wooded slopes, 500 to 3000 feet: North Coast Ranges; Sacramento Valley; northern Sierra Nevada. North to Washington, east to Wyoming. May.

Tax. note.—Apparently rare in California, Lathyrus pauciflorus is sometimes difficult to segregate from less typical specimens of L. bolanderi Wats. The plants of L. pauciflorus are perfectly glabrous; the calyx-teeth are typically shorter and narrower and with wider sinuses (especially between the lower tooth and the lateral teeth) than in L. bolanderi, and the raceme is fewer-flowered.

Locs.—Mt. Sanhedrin (Bot. Gaz. 80:249); Bull Creek, Humboldt Co., *Jepson* 16,455 (intergrade to L. bolanderi Wats.); Marysville Buttes, *Heller* 11,370a; Nevada City and Quincy (Bot. Gaz. 80:249).

Var. **schaffneri** Jepson comb. n. Leaflets obovate or elliptical, coriaceous and venulose, 5 to 9 (or 11) lines long, mostly smaller than in the species; racemes usually 2 to 5-flowered; flowers 6 to 8 lines long.—Siskiyou and Modoc Cos. to Sierra Co.; Kern Co. East to Colorado and New Mexico, south to Mexico and Lower California. The leaflets of the lower leaves often tend to be small and crowded.

Locs.—Oro Fino, Siskiyou Co., *Butler* 1212; Forestdale, sw. Modoc Co., *M. S. Baker;* Big Mdws., Plumas Co., *R. M. Austin* 39; Janesville, Lassen Co., *T. Brandegee;* Tehachapi Mts. (Bot. Gaz. 80:250).

Refs.—LATHYRUS PAUCIFLORUS Fer. Bot. Gaz. 19:335 (1894), type loc. Roseburg, Ore., *Howell* 677. *L. polyphyllus* Wats. Bot. King 78 (1871), "Oregon, California (*Brewer*) and Utah", not L. polyphyllus Nutt. (1838). *L. ecirrhosus* Hel. Muhl. 1:54 (1904), type loc. s. slopes Mt. Sanhedrin, Lake Co., *Heller* 5944. *L. bradfeldianus* Nels. Bot. Gaz. 54:411 (1912), type loc. Silver City, Idaho, *Macbride* 927. Var. SCHAFFNERI Jepson. *L. pauciflorus* subsp. *schaffneri* Piper, Proc. Biol. Soc. Wash. 31:194 (1918), based on next. *L. parvifolius* Wats. Proc. Am. Acad. 17:345 (1882), type loc. San Miguelito Mts., San Luis Potosi, Mex., *Schaffner* 812; not L. parvifolius Roth (1797). *L. schaffneri* Rydb. Mem. N. Y. Bot. Gard. 1:258 (1900).

10. **L. polyphyllus** Nutt. OREGON PEA. Stem erect, angled, 1½ to 2½ feet high; herbage rather light-colored, perfectly glabrous; leaflets elliptic-ovate, obtuse at base and apex, mucronulate, ⅝ to 2½ inches long; stipules as large as the leaflets to half as large, ovate, acuminate or ovate-lanceolate, dilated below into a rounded toothed lobe, 3 to 9 lines broad; racemes 5 to many-flowered; lower calyx-teeth distinctly longer than tube; corolla rose-purple, fading blue or yellowish, 7 to 8 lines long.

Shady woods, 50 to 2500 feet: Mendocino Co. to Del Norte Co. North to British Columbia. June-July.

Tax. note.—In California Lathyrus polyphyllus reaches its most characteristic or distinctive phase in the more northerly North Coast Ranges. Near the southern limits of its range it becomes increasingly difficult to segregate from L. bolanderi. Where the ranges of L. polyphyllus and L. bolanderi overlap in the north, the two forms apparently intergrade.

Locs.—Ft. Bragg, Mendocino Co., *W. C. Mathews* 37; Sherwood, Mendocino Co., *Davy & Blasdale* 1068; Idol House, Mendocino Co., *Chandler* 1075; Little Bear Harbor, Humboldt Co., *Bolander* 6508; Bell Sprs. to Harris, Humboldt Co., *Davy* 5355, 5358; Buck Mt., Humboldt Co., *Tracy* 2731; Korbel to Angel's Ranch, n. Humboldt Co., *Jepson* 1930; Smith River, Del Norte Co., *Goddard* 328 (approaching L. pauciflorus Fer. in number of leaflets and flowers).

Var. **insecundus** Jepson. Raceme not one-sided; calyx-lobes subulate, very prominent in the bud.—Near the ocean in Marin Co. (Olema).

Refs.—LATHYRUS POLYPHYLLUS Nutt.; T. & G. Fl. 1:274 (1838), type loc. "forests of the Oregon [Columbia River] to the sea," *Nuttall;* Jepson, Man. 585 (1925). Var. INSECUNDUS Jepson, l.c., type loc. Olema, Marin Co., *Jepson* 13,644.

11. **L. sulphureus** Brew. SNUB PEA. Stems rather stout, 1 to 2 feet high; herbage glabrous; leaflets 6 to 12, not closely paired on the rachis, or commonly distinctly alternate, oblong-ovate to elliptic, cuspidate at apex, ¾ to 2 inches long; stipules small or large, mostly broad; peduncles 2 to 4 inches long; racemes mostly dense, 1 to 1½ (or 2¾) inches long, 6 to 25-flowered; pedicels recurved; lowest calyx-tooth rather shorter than or equaling the tube, the upper teeth very short or almost obsolete (⅙ to ⅓ as long as the lateral teeth); corolla 5 to 7 lines long, dull white or the banner slightly pinkish or purple-veined, all parts turning yellowish-brown.

Mountain slopes, 2200 to 6800 feet: inner North Coast Range from northern Lake Co. to Siskiyou Co.; Sierra Nevada from Kern Co. to Plumas Co. May-July.

Note on flower.—The banner does not exceed, or scarcely, the wings and keel. The keel is rounded and curved above so as to form a blunt or truncatish apex to the corolla, this bluntness being a feature of the corolla in this species. The keel and wings are white or yellowish-white, the whole corolla very soon becoming sordid, so that the close raceme of flowers is most conspicuous for its sordidness.

Locs.—Inner North Coast Range: Snow Mt., n. Lake Co., *T. Brandegee;* East Weaver Creek, Trinity Co., *H. S. Yates* 324; Klamath River near Yreka, *Butler* 707. Sierra Nevada: Greenhorn Mts., *Peirson* 10,689; Cedar Creek, North Fork Kaweah River, *Jepson* 616a; Pinehurst, Fresno Co., *Newlon* 205; Northfork, Madera Co., *Noddin;* Fresno Flats, Madera Co., *Jepson* 12,856; Mariposa, *Congdon;* betw. Hazel Green and Yosemite, *Jepson* 13,625; Columbia, Tuolumne Co., *Jepson* 6280; Gwin Mine, Calaveras Co., *Jepson* 1781a; Auburn, *M. E. P. Ames;* Blue Cañon, Placer Co., *H. A. Walker* 1291; Quincy, *Heller* 10,833; Brush Creek, Butte Co., *Kate Conger.*

Var. **argillaceus** Jepson var. n. Herbage puberulent; leaflets 6 to 10, broadly elliptical; stipules ⅙ to ¼ the size of the leaflets; peduncles 1¼ to 3½ inches long, equaling or slightly exceeding the leaves; flowers 7 to 8 lines long.—(Herbae puberulae; foliola 6–10, late elliptica; stipulae ⅙–¼ aeque magnae quam foliola; pedunculi unc. 1¼–3½ longi, folia aequantes vel parum superantes; flores lin. 7–8 longi.)—Rolling plains of western Tehama and Shasta Cos.: Rosewood, *Jepson* 13,635 (type); Crane Creek, *Jepson* 13,634; Redding, *Blankinship.*

Refs.—LATHYRUS SULPHUREUS Brew.; Gray, Proc. Am. Acad. 7:399 (1868), type from the Sierra Nevada foothills; Jepson, Man. 584 (1925). *L. ochroleucus* var. Torr. Pac. R. Rep. 4:77 (1857), type loc. hillsides, Murphy's, Calaveras Co., *Bigelow. L. ochropetalus* subsp. *holochlorus* Piper, Proc. Biol. Soc. Wash. 31:190 (1918), type loc. hills s. of Corvallis, Ore., *H. C. Gilbert* 115. *L. ochroleucus* of various authors (not of Hooker). Var. ARGILLACEUS Jepson.

12. **L. maritimus** Bigelow var. **glaber** Eames. SAND PEA. Stems stout, 1 to 2 feet high, at length decumbent; herbage glabrous; leaflets elliptic, obtuse at apex, mucronulate, ¾ to 1¾ inches long; stipules broadly ovate, acute, as large as or approximating the leaflets; upper calyx-teeth ½ to ¾ as long as the lower; corolla purple, 9 to 10 lines long; ovary heavily glandular-pubescent; pods red-brown, 1½ to 2 inches long, 4½ to 5½ lines wide.

Sandy ocean beaches: Humboldt Co. to Del Norte Co. North to Alaska; shores of the Great Lakes, Labrador and Arctic Ocean. June-Aug.

Locs.—Eureka, *Tracy* 3736; Crescent City, *Jepson* 9390. Aleutian Isls.: Dutch Harbor, *Jepson* 117.

Refs.—LATHYRUS MARITIMUS Bigelow, Fl. Bost. ed. 2, 268 (1824). *Pisum maritimum* L. Sp. Pl. 727 (1753), type European. Var. GLABER Eames, Rhod. 11:95 (1909). *Pisum maritimum* var. *glabrum* Ser.; DC. Prod. 2:368 (1825), type from Canada. *L. californicus* Dougl.; Lindl. Bot. Reg. t. 1144 (1828), type cult. from spms. from Northwest Coast, *Douglas. L. pisiformis* Hook. Fl. Bor. Am. 1:158 (1834), based on North American plants. *L. maritimus* Jepson, Man. 584 (1925), not Bigelow (1824).

13. **L. palustris** L. MARSH PEA. Stems glabrous or pubescent, slender, climbing, 2 to 3½ feet long; wings often broad; leaflets usually 4 to 6, oblong to linear-oblong, firm, 1 to 1¾ inches long; tendrils long, branched or simple; stipules narrow, semi-sagittate, ½ to ¾ inch long; peduncles exceeding rachis, 3 to 6-flowered; lower calyx-teeth lanceolate, about as long as the tube, upper deltoid, very short; flowers blue (in ours), 7 to 9 lines long; pods glabrous, about 2½ inches long.

Coastal marshes, 10 to 100 feet: Humboldt Co. to Del Norte Co. North to Alaska, east to New England; Europe. June-July.

Tax. note.—Lathyrus palustris differs from L. jepsonii and L. watsonii in its more slender habit, in having fewer leaflets and in its racemes which are only 3 to 6-flowered.

Locs.—Samoa, Humboldt Co., *Tracy* 2593; Lake Earle, Del Norte Co., *Davy*.

Refs.—LATHYRUS PALUSTRIS L. Sp. Pl. 733 (1753), type from Europe. *L. occidentalis* Nutt.; T. & G. Fl. 1:276 (1838), as synonym, "mouth of the Oregon" [Columbia River], *Nuttall*.

14. **L. watsonii** White. BUFF PEA. Stems erect, stoutish, strongly winged, or at least evidently winged, 1½ to 2½ feet high, or climbing 4 to 6 feet; herbage light green, glaucous, finely pubescent or subglabrous; leaflets 1 to 3 inches long, 3 to 7 (or 17) lines wide, tapering from the middle to each end, acute, mucronate, strongly several-nerved from the base or near the base, the nerves branching little and almost parallel; stipules semi-sagittate, narrow, the upper lobe lanceolate, the lower lobe little dilated, commonly entire; racemes 4 to 18-flowered, on peduncles 2½ to 7 inches long; calyx sparingly to densely pubescent; lower calyx-teeth lanceolate, subequal, equaling or longer than tube; corolla white, the banner pink-veined and soon pink-flushed, all the petals turning buff, or sordid in age, 8 to 10 lines long; pods 2 inches long, 4 lines wide; seed with a small aril.

Sandy slopes in foothills or cañons, sandy ridgelets in valleys, or along streams, 50 to 5000 feet: South Coast Ranges from San Luis Obispo Co. to Alameda Co.; inner North Coast Range from Solano Co. to Siskiyou Co.; Sacramento Valley; Sierra Nevada foothills from Tulare Co. to Shasta Co. Mar.-July.

Locs.—Coast Ranges: Paso Robles, *Barber;* upper Cholame Creek, se. Monterey Co., *Jepson* 15,904; Castroville, *Davy* 7546; Los Buellis hills, Mt. Hamilton Range, *R. J. Smith* (herbage glabrous and thus difficult to distinguish from L. jepsonii Greene); Oakland Hills, *Chesnut;* Miller Cañon, Vaca Mts., *Jepson* 13,643; Rutherford, Napa Valley, *Tracy* 2079; Ukiah, *Blasdale* 1011; Round Valley, ne. Mendocino Co., *Westerman;* Martin ranch, South Fork Trinity River, *Jepson* 2010; Stuarts, Trinity Co., *H. S. Yates* 480; Shasta Sprs., *Jepson* 13,617; Shackelford Creek, w. Siskiyou Co., *Butler* 1644. Sacramento Valley: Vacaville, *Jepson* 6269, 13,616; Sacramento River (w. of Chico), *Heller* 11,345. Sierra Nevada: Springville, Tulare Co., *T. Brandegee;* Northfork, Madera Co., *Noddin;* Columbia, Tuolumne Co., *Jepson* 6344; New York Falls, Amador Co., *Hansen* 346; Bear Valley, Nevada Co., *Jepson* 13,623; Mineral, Tehama Co., *J. Grinnell;* Morleys sta., Shasta Co., *Baker & Nutting.*

Refs.—LATHYRUS WATSONII White, Bull. Torr. Club 21:447 (1894); Jepson, Fl. W. Mid. Cal. 298 (1901), ed. 2, 239 (1911). *L. venosus* var. *californicus* Wats. Proc. Am. Acad. 11:133 (1876), "Sonoma Co. to Monterey and in the foothills of the Sierra Nevada". *L. californicus* Wats. Proc. Am. Acad. 20:363 (1885); Jepson, Man. 585 (1925); not L. californicus Dougl. (1828).

15. **L. jepsonii** Greene. TULE PEA. Stems 3 to 8 feet high, climbing, strongly winged along the angles; herbage glabrous; leaflets 8 to 12, linear-lanceolate, mucronulate, 1 to 1¾ inches long; stipules semi-sagittate, both the apical and basal lobes lanceolate or oblong; peduncles mostly shorter than the leaves; lower calyx-teeth narrow-lanceolate, the lowest one equaling the tube; corolla rose-purple, 8 to 10 lines long; pods 1¾ to 2¼ inches long, 3 to 4 lines wide.

Banks of tidewater sloughs: delta region of the Great Valley; Suisun and San Pablo bays. July-Sept.

Locs.—Stockton, *Greene;* Brannan Isl., lower Sacramento River, *Jepson* 10,219; Rough and Ready Isl., San Joaquin Co., *Berg;* Teal sta., Suisun marshes, *Jepson* 10,231, 13,624; Napa River (at drawbridge), *Bioletti.*

Refs.—LATHYRUS JEPSONII Greene, Pitt. 2:158 (1890), type loc. Suisun marshes, *Jepson* 13,624; Jepson, Fl. W. Mid. Cal. 299 (1901), ed. 2, 239 (1911), Man. 585, fig. 580 (1925). *L. palustris* var. *e* T. & G. Fl. 1:276 (1838), type from California, *Douglas.*

LATHYRUS LATIFOLIUS L. Sp. Pl. 733 (1753), type European. Everlasting Pea. Climbing perennial, stems winged; herbage glabrous; leaflets 1 pair, narrowly oblong to lanceolate, 1½ to 3¾ inches long; tendrils stout and branched; peduncles exceeding the leaves, several to many-flowered; corolla rose, varying to white; banner very large; pods 3 to 5 inches long.—Cultivated from Europe, sometimes a transient escape: Scotia, lower Eel River Valley, *Jepson* 16,464.

29. **ALHAGI** Desv.

Spiny shrub. Leaves simple, entire, deciduous. Flowers few in racemes. Calyx short-campanulate, subequally toothed. Stamens diadelphous. Banner with incurved margin. Pods linear, incompletely 2-celled, constricted between the seeds.—Species 3, Mediterranean region and southern Asia. (The Mauretanian name.)

1. **A. camelorum** Fisch. Camel Thorn. One to 2 feet high; spines numerous, slender, ½ to 1 inch long; flowers lavender-red, 4 to 5 lines long.

Naturalized from Asia and Africa: Colorado Desert; San Joaquin Valley. July.

Immigrant note.—This species of Old World deserts was detected in California at Indio in the Coachella Valley of the Colorado Desert in 1914. It is likely that seed was introduced in the packings of shipments of date cuttings from Africa or in impure alfalfa seed from Turkestan. At once recognized as a serious agricultural pest, attempts to exterminate it promptly have failed by reason of the depth and extent of the root system and the hardness of the seed coats which permits dispersal by animals through the digestive tract. It is spreading slowly and has since become established in the Imperial Valley and in the San Joaquin Valley (cf. Mo. Bull. Cal. Dept. Agr. 14:193–196,—1925; 19:376, 603,—1930). The following stations (up to Feb. 2, 1931) have been recorded by W. S. Ball, California Department of Agriculture: Calipatria and Westmoreland districts, Imperial Valley (33 infestations, some of which have been eradicated); Mecca and Indian Wells, Riverside Co.; near Lerdo, Rosedale, Bellevue and Stevens, Kern Co.; near Remnoy, Kings Co.; near Bowles and Conejo, Fresno Co.; near Gustine, Merced Co.

Refs.—Alhagi camelorum Fisch. Hort. Gorenk. ed. 2, 72 (1812), type from Asia; Jepson, Man. 585 (1925).

KRAMERIACEAE. Krameria Family

Shrubs with alternate usually simple leaves without stipules. Peduncles 1-flowered, bearing bractlets. Flowers perfect, irregular. Calyx with 4 or 5 sepals, petal-like. Petals 3 or 5, small, clawed, borne on the upper side of the flower. Stamens 3 to 5, all on the upper side of the flower; anther-cells opening by a terminal tube or pore. Ovary superior, at first 2-celled, one cell anterior, the other posterior, but the latter early abortive; style one, stigmatic at apex; ovules 2; ovary glands 2, lateral, thick, fleshy. Fruit dry, nearly globular, indehiscent, spiny, 1-seeded, the spines retrorsely barbed at apex.—Genus 1.

Bibliog.—Rose, J. N., N. Am. species of Krameria (Contrib. U. S. Nat. Herb. 10:107–108,—1906). Britton, N. L., Krameriaceae in N. Am. Fl. 23:195–200 (1930).

1. **KRAMERIA** L.

More or less root-parasitic shrubs. Leaves (in ours) simple and entire. Flowers purple. Sepals in ours 5. Stamens in ours 4, in two unequal pairs. Ovules pendulous.—Species about 14, North and South America, mostly tropical. (J. G. H. Kramer, Austrian army physician, 18th century, author of a key to the herbs, shrubs and trees.)

Spines on fruit barbed at apex; lateral sepals lanceolate........1. *K. grayi.*
Spines on fruit barbed their whole length; lateral sepals ovate........2. *K. parvifolia.*

1. **K. grayi** Rose & Painter. White Ratany. Intricately and densely branched thorny shrub 1½ to 2¼ feet high; young parts tomentose; leaves lanceolate or linear, acute, 2 to 5 lines long; peduncles bearing near middle one pair of opposite bracts; calyx 4 to 5 lines long, lightly tomentose without, deep purple within; sepals oblong-lanceolate or lanceolate, acute, the upper 2 approximate, erect or recurving, lateral pair upwardly curving with falcate tips, the lower one spreading downward; petals red-purple with yellowish claws; style with a white-pubescent zone at base; pods globose, 4 lines long, armed with many slender (2 lines long) spines barbed at tip.

Stony mesas and hillslopes, 300 to 2000 feet: Mohave and Colorado deserts. East to New Mexico, south to Mexico and Lower California. May-Nov.

Ovary glands.—In Krameria grayi the ovary glands are quadrangular in outline with the outer face glandular-tesselate; they are a little smaller than in K. parvifolia, in which the quadratish glands are as if composed of a number of laterally joined sterile filaments. This presumed distinction between the species appears to hold consistently. In certain cases there is a suggestion that the glands of K. parvifolia may possibly be derived from staminodes. In both species the glands are purple.

Locs.—Ludlow, *Jepson* 5504; Needles, *Newlon* 547; Riverside Mts., Colorado River, *Jepson* 5238; Milpitas, Imperial Co., *Jepson* 5290; Palm Cañon of Mt. San Jacinto, *Jepson* 1394, 1403; Devils Cañon, Santa Rosa Mts., *Clary;* Vallecito, e. San Diego Co., *Jepson* 8539; Myers Creek bridge, foot of Mountain Sprs. grade, *Jepson* 11,765; Coyote Wells, sw. Colorado Desert, *Newlon* 393.

Refs.—KRAMERIA GRAYI Rose & Painter, Contrib. U. S. Nat. Herb. 10:108 (1906). *K. canescens* Gray, Pl. Wright. 1:42 (1852), type loc. "prairies near the Pecos", Tex., *Wright;* Jepson, Man. 512, fig. 510 (1925); not K. canescens Willd. (1825). *K. triandra* var. *humboldtiana* Chod. Arch. Sci. Phys. et Nat. ser. 3, 24:498 (1890).

2. **K. parvifolia** Benth. PIMA RATANY. Shrub mostly low and spreading, 1 to 1½ feet high, 2 to 4 feet broad, similar to no. 1; peduncles bearing 2 or 3 opposite pairs of leaf-like bracts; calyx 3 to 3½ lines long; sepals roundish-ovate, the lateral a little broader than the upper, the lowermost oblong, all somewhat obtuse; upper petals with ovatish limb.

Gravelly slopes and mesas, 500 to 2700 feet: Mohave Desert, south along western borders of the Colorado Desert to Lower California. East to New Mexico. Apr.-May.

Locs.—Palm Cañon of San Ysidro, *Jepson* 8814; Silent Cañon, foothills, se. end of Santa Rosa Mts., *Jepson* 11,692; Devils Cañon, Santa Rosa Mts., *Clary;* Palm Cañon of San Jacinto, *Jepson* 1371; Cushenbury Cañon, n. side San Bernardino Mts., *Parish;* Ord Mt., *Jepson* 5851.

Var. **glandulosa** Mcbr. HEART-NUT. Habit more erect, branching less angular; peduncles and outer sepals stipitate-glandular; ovary glands crimson.—Santa Rosa Mts. (Devils Cañon, *Clary;* Agua Alta, *Clary* 1202); Summit sta., e. of Haloran Spr., e. Mohave Desert, *Jepson* 15,808; betw. Vontrigger and Goffs, acc. *Mary Beal.* East to Utah and Texas, south to Sonora.

Refs.—KRAMERIA PARVIFOLIA Benth. Bot. Voy. Sulph. 6, pl. 1 (1844), type loc. Magdalena Bay, L. Cal.; Jepson, Man. 512 (1925). *K. parvifolia* var. *imparata* Mcbr. Contrib. Gray Herb. 56:52 (1918), type loc. Mountain Sprs., e. San Diego Co., *M. F. Spencer. K. imparata* Britt. N. Am. Fl. 23:199 (1930). Var. GLANDULOSA Mcbr. Contrib. Gray Herb. 56:52 (1918). *K. glandulosa* Rose & Painter, Contrib. U. S. Nat. Herb. 10:108 (1906), type loc. El Paso, Tex., *Rose* 4904.

LINACEAE. FLAX FAMILY

Herbs. Leaves alternate, or sometimes opposite, simple, small, entire, without stipules or these sometimes replaced by a gland. Flowers mostly in cymose panicles, perfect, regular, in ours 5-merous. Petals distinct, very quickly falling. Stamens 5, more or less united at base. Styles 2 to 5, distinct. Cells of the superior ovary as many as the styles, or twice as many by the formation of a false division wall from the back of each cell, these false partitions frequently not complete. Fruit a capsule, splitting through the false partitions and frequently also septicidal.—Genera 10 and species about 150, all continents.

Bibliog.—Gray, A., Linum sect. Hesperolinon (Proc. Am. Acad. 6:521,—1865); Trelease, W., Revision of N. Am. Linaceae (Trans. St. Louis Acad. Sci. 5:7–20, pls. 3–4,—1887), Linaceae in Gray, Syn. Fl. 1^1:344–349,—1897.

1. LINUM L. FLAX

Leaves sessile or subsessile. Our only genus.—Species about 90, all continents, mainly temperate regions. (Ancient Latin name of these plants).

Our species, save three, are of the section Hesperolinon which is limited to the Pacific Coast of North America and has its chief development in Lake Co. and the surrounding region of the North Coast Ranges. The petals in species of this section bear ventrally at base a transverse wing which is continuous with the angle or tooth on each side of the claw or narrowed base. This wing, sometimes reduced or obsolete, is cleft into 3 divisions or scales, the lateral ones usually being smaller.

- Styles 5; flowers blue, petals without ventral scales at base; stamens with 5 short alternating staminodes (Sect. Eulinum).
  - Annual; stigmas elongated.......1. *L. usitatissimum.*
  - Perennial; stigmas nearly as broad as long.......2. *L. lewisii.*
- Styles less than 5; stamens without alternating staminodes.
  - Styles 2; petals without ventral scales; flowers yellow; upper leaves serrate (Sect. Cathartolinum).......3. *L. digynum.*
  - Styles 3; petals commonly with a tooth on each side at base and a median scale or appendage; filaments more or less dilated at the united base (Sect. Hesperolinon).
    - Leaves not glandular-margined.
      - Pedicels short and flowers in rather close clusters.
        - Flowers yellow.......4. *L. breweri.*
        - Flowers white, pink or rose-purple.
          - Stems shortly branched at top; sepals pubescent.......5. *L. congestum.*
          - Stems paniculately branched; sepals glabrous.......6. *L. californicum.*
      - Pedicels usually elongated and flowers mostly solitary; stems much branched.
        - Flowers pinkish or white; stems diffusely paniculate above.
          - Petals about 3 lines long; pedicels straight.......7. *L. spergulinum.*
          - Petals about 2 lines long; pedicels curved at apex.......8. *L. micranthum.*
        - Flowers yellow, the petals ¾ to 1½ lines long; stems repeatedly dichotomous.......9. *L. clevelandii.*
    - Leaves closely margined with stipitate glands.
      - Pedicels long, solitary; petals yellow; sepals merely acute.......10. *L. adenophyllum.*
      - Pedicels short, mostly clustered; petals rose-pink; sepals acuminate, cuspidate.......11. *L. drymarioides.*

1. **L. usitatissimum** L. COMMON FLAX. LINSEED. Annual or biennial; stems one or several from the base, 1 to 3 feet high; herbage glabrous; leaf-blades lanceolate to linear, acute or acuminate, ¼ to 1¼ inches long; flowers 6 to 8 lines long, on pedicels ⅓ to 1¼ inches long; petals blue; stigmas elongated; capsule depressed-globose, shortly acute, 2½ to 3½ lines long; septa not ciliate.

Native of Asia, locally introduced, sometimes established, sometimes fugitive; mostly along the coast. June-July.

Econ. note.—The wild ancestor of this, the cultivated flax, is not certainly known, but is probably Asiatic. Archaeologists have uncovered flax mills in deposits 5000 years old in Babylonia and in stone age deposits of Europe. In California cultivation of this species has been sporadic—usually involving merely a half hundred or a few hundred acres sown as a seed crop, never for fibre, at long and irregular intervals.

Locs.—Redlands (Bull. S. Cal. Acad. 19^4:21); Los Angeles (Erythea 1:58); Moss Beach, San Mateo Co., *K. Brandegee;* San Francisco (Zoe 2:344); West Berkeley, *Pendleton & Reed;* Bear River Ridge, Humboldt Co., *Tracy* 6279; Trinidad, *Tracy* 3236; Hupa Mt., *Davy* 5685.

Refs.—LINUM USITATISSIMUM L. Sp. Pl. 277 (1753), type European; Hegi, Fl. Mit.-Eur. 5^1:20, fig. 1676 (1925).

2. **L. lewisii** Pursh. WESTERN BLUE FLAX. Stems several from a woody root-crown, erect, thickly clothed with leaves, simple below the corymbosely branched summit; herbage glabrous; leaf-blades linear-lanceolate or linear, acute, 5 to 11 lines long; flowers in terminal loose and somewhat corymbose clusters, or racemose on the branches; sepals ovate, 3 to 5-nerved; corolla blue, 6 to 10 lines wide; pedicels 6 to 7 lines long, becoming elongated in fruit; sepals ovate, 3 to 5-nerved; capsule globose, acute, 4 to 5 lines long, eventually dehiscent by 10 valves, the valves often with a brown midnerve.

Mountain slopes and valleys, 10 to 11,000 feet: mostly in the high montane region, rare in the deserts and Coast Ranges, absent from the Great Valley. East to Texas, north to British America. May-Aug.

Locs.—Coast Ranges: summit betw. Marble Mt. and Woolly Creek, *Butler* 9; South Yollo Bolly, *Jepson* 13,537; West Berkeley, *Jepson* 13,538; New Idria, San Carlos Range, *Jepson;* Atascadero, *Brewer* 502. Sierra Nevada: lava beds, Modoc Co., *M. S. Baker;* Lassen Peak, *J. Grinnell;* Warner Creek, Plumas Co., *Jepson* 12,282; Fales Hot Sprs., Mono Co., *Ottley* 1112; Kennedy Lake, Tuolumne Co., *A. L. Grant* 284; Bloody Cañon, Mono Co., *Chesnut & Drew;* Alta Mdws., Tulare Co., *Newlon* 41. Desert ranges: White Mts., *Shockley* 469; Barnwell, New York Mts., *Jepson* 5458. S. Cal.: North Creek wash, Mt. Pinos, *Hall* 6435; Fish Creek, San Bernardino Mts., *J. Grinnell* 3; Strawberry Valley, Mt. San Jacinto, *Jepson;* Middle Peak, Cuyamaca Mts., *Peirson* 5995.

Var. **alpicola** Jepson var. n. Stems 5 to 6 inches high, the lower portion densely clothed with leaves; leaf-blades linear, 1 to 4 lines long; flowers 4½ to 5½ lines long.—(Caules unc. 5–6 alti, infra dense foliosi; folia linearia, lin. 1–4 longa; flores lin. 4½–5½ longi.)—Mt. Whitney, 11,600 feet, *Hall* 8432 (type).

Refs.—LINUM LEWISII Pursh, Fl. 210 (1814), type loc. "valleys of the Rocky Mts. and on the banks of the Missouri", *Lewis;* Jepson, Man. 586 (1925). Var. ALPICOLA Jepson.

3. **L. digynum** Gray. Stem slender, mostly simple below, corymbosely forked above, 3 to 9 inches high; herbage glabrous, somewhat glaucous; leaves usually opposite, their blades elliptic to spatulate-oblong or narrowly ovate, 3 to 9 lines long, the lower entire, the upper sharply serrate; flowers short-pedicelled, and in somewhat racemose clusters along the terminal branches; sepals very unequal, obtuse; petals yellow, not appendaged, 1½ lines long; capsule with 2 carpels, the false septa complete.

Moist grassy meadows, 3500 to 4700 feet: Sierra Nevada from Fresno Co. to Siskiyou Co. North to Washington. June-July.

Locs.—Bass Lake, Fresno Co., *C. E. Jenney;* Hoeltzels Mdw., Mariposa Co., *Congdon;* Hog Ranch, Tuolumne Co., *Keck & Heusi* 302; Hetch-Hetchy, *Chesnut & Drew;* Quincy, Plumas Co.; Sisson.

Refs.—LINUM DIGYNUM Gray, Proc. Am. Acad. 7:334 (1868), type loc. Mariposa Trail, Yosemite Valley, *Bolander;* Jepson, Man. 586 (1925). *Cathartolinum digynum* Small, N. Am. Fl. 25:78 (1907).

4. **L. breweri** Gray. VACA FLAX. Stem 9 to 14 inches high, with a few short branches at the top; herbage glabrous and glaucous or sometimes minutely puberulent in the forks; leaf-blades narrowly linear, 5 to 11 lines long; sepals broadly lanceolate, attenuate, some slightly glandular on the margin; petals yellow, obovate, not emarginate, 3 to 3½ lines long, more than twice as long as the sepals; claw of petals with a quadratish or oblong central scale, the lateral scales smaller, all hairy on the upper side.

Dry hill or cañon sides, grassy opens amongst oaks or brush, 400 to 1700 feet: inner Coast Range from Mt. Diablo to the Vaca Mts. May-June.

Locs.—Donner Cañon, Mt. Diablo, *Jepson* 7568; upper Suisun Valley, *Jepson* 13,532; Araquipa Hills, nw. Solano Co., *Jepson* 13,531; Vaca Mts., *Jepson* 13,533 (Gates Cañon), 13,534 (Miller Cañon).

Refs.—LINUM BREWERI Gray, Proc. Cal. Acad. 3:102 (1864), type loc. Marshs Ranch, Mt. Diablo, *Brewer;* Jepson, Fl. W. Mid. Cal. 245 (1901), ed. 2, 241 (1911), Man. 587 (1925). *Hesperolinon breweri* Small, N. Am. Fl. 25:85 (1907).

5. **L. congestum** Gray. MARIN FLAX. Stem corymbosely branched at the middle or above, 8 to 18 inches high; leaf-blades linear to lanceolate, somewhat pubescent, 4 to 13 lines long, with prominent stipular glands; flowers terminating the branches in close clusters; sepals pubescent; petals rose-pink in bud, dull white in anthesis, 3 to 4 lines long; middle scale very slender, elongated, 4 to 5 times as long as the lateral scales, sometimes hairy; capsule short-ovoid, nearly as long as the calyx.

Open hills, 20 to 1000 feet: coastal region from Marin Co. to San Mateo Co. June.

Locs.—Tiburon, *Jepson* 12,926; San Francisco, *Alice King;* San Mateo Co., *Greene.*

Refs.—LINUM CONGESTUM Gray, Proc. Am. Acad. 6:521 (1865), type loc. Marin Co., *Bolander;* Jepson, Fl. W. Mid. Cal. 244 (1901), ed. 2, 241 (1911). *Hesperolinon congestum* Small, N. Am. Fl. 25:86 (1907). *L. californicum* var. *congestum* Jepson, Man. 587 (1925).

6. **L. californicum** Benth. Stem paniculately branched above, with angled or striate branches, ¾ to 2 feet high; herbage glabrous and glaucous; leaf-blades linear, 5 to 12 lines long, with prominent stipular glands; sepals lanceolate, the

3 inner with sparingly glandular-ciliate inner margins; petals white or pinkish, 2 to 3½ lines long, the median scale oblong and microscopically short-hairy above, the lateral ones short, long-hairy above; capsule ovoid, acute, a little shorter than the sepals.

Open or brushy hillslopes, 1000 to 2000 feet: inner Coast Range from Glenn and Lake Cos. to the San Carlos Range. May-June.

Locs.—Coast Ranges: Mud Flat, w. Glenn Co., *Heller* 11,529; Wilbur Sprs., sw. Colusa Co., *Jepson* 9031; Bear Valley, ne. Lake Co., *Jepson* 8972, colony of 2 acres forming a uniform stand; Zem Zem, n. of Berryessa Valley, Napa Co., *Jepson* 13,546; Howell Mt., *Jepson* 13,535, *Tracy* 384; Chiles Creek hills, Napa Range, *Jepson* 9068; Vaca Mts., *Jepson* 13,543; Mt. Diablo, *M. S. Baker;* Orestimba Cañon, w. Stanislaus Co., *Brewer* 1275; Lorenzo Creek, s. San Benito Co., *Jepson* 12,223. Butte Co.: Chico, *R. M. Austin* 194; Oroville (8 mi. n.), *Heller* 11,323.

Refs.—LINUM CALIFORNICUM Benth. Pl. Hartw. 299 (1848), type loc. "Sacramento Valley", *Hartweg* 325, specifically at the Marysville Buttes (cf. Jepson, Erythea 5:54); Jepson, Fl. W. Mid. Cal. 244 (1901), ed. 2, 240 (1911), Man. 587 (1925). *Hesperolinon californicum* Small, N. Am. Fl. 25:86 (1907). *L. californicum* var. *confertum* Gray; Trel. Trans. St. Louis Acad. 5:19 (1887), type loc. Mare Isl., Solano Co., *Lemmon, Greene. Hesperolinon confertum* Small, N. Am. Fl. 25:86 (1907).

7. **L. spergulinum** Gray. Stem more or less dichotomously paniculate, 11 to 18 inches high, the branches slightly hairy in the forks; leaf-blades linear, 4 to 12 lines long; pedicels filiform, rigid, straight, 3 to 10 lines long; sepals ovate, nearly 1 line long; petals round-ovate or obovate, usually notched or 3-toothed at apex, white or slightly pink, 3 to 3½ lines long; base of petals strongly 3-nerved; middle appendage large, erect, oblong or obovate, often truncatish at apex, hairy on inside, drawn down to a claw-like base; lateral scales very small, hairy, forming a sort of horn-like process or tooth at each angle of the claw; capsule ovoid, acute, 1¼ to 2 times as long as the calyx.

Dry open or brushy hill slopes, 800 to 2000 feet: North Coast Ranges from Humboldt and Lake Cos. to Sonoma and Napa Cos.; San Carlos Range, west slope; San Diego Co. June-July.

Locs.—Covelo, ne. Mendocino Co., *Eastwood;* Shelter Cove, Mendocino Co., *Bolander* 6568; Hemlock, se. Mendocino Co., *Jepson* 13,545; Ukiah, *J. S. Cotton;* Mt. Konocti, *Jepson* 13,541; Butts Cañon, Lake Co., *K. Brandegee;* Calistoga, *Parry;* Howell Mt., *Jepson* 1728, 6828, 14,380; Santa Rosa, *Heller* 5751; Sonoma Cañon, Kenwood, *Jepson* 10,008; Lewis Creek, inner South Coast Range (Zoe 4:150); Pine Hills, Cuyamaca Mts. (Bull. Torr. Club 49:36).

Refs.—LINUM SPERGULINUM Gray, Proc. Am. Acad. 7:333 (1868), type loc. Cloverdale, Sonoma Co., *Bolander;* Jepson, Fl. W. Mid. Cal. 244 (1901), ed. 2, 240 (1911), Man. 587, fig. 581 (1925). *Hesperolinon spergulinum* Small, N. Am. Fl. 25:86 (1907).

8. **L. micranthum** Gray. Stem freely branched above the base, 5 to 16 inches high, the branches minutely pubescent in or near the forks, especially on the upper side, disposed to be ascending rather than diffuse; leaf-blades linear to linear-oblong, obtuse, 3 to 11 lines long; flowers white or pinkish, somewhat nodding on straight or nearly straight filiform pedicels; fruiting pedicels 2 to 6 (or 9) lines long; sepals oblong-lanceolate, the inner sparingly glandular-ciliate; petals elliptic, white or faintly pink, 1 to 1½ (rarely 2½) lines long, the central scale ciliate, the lateral small, or all more or less obsolete; capsule ovoid, equal to the sepals.

Open or brushy ridges, 1800 to 5000 feet: hill country nearly throughout California except the deserts. North to Oregon. May-July.

Locs.—Sierra Nevada: Goosenest foothills, Siskiyou Co., *Heller* 1582; Lassen Creek, Modoc Co., *R. M. Austin;* Susanville, *T. Brandegee;* Volcano, Amador Co., *K. Brandegee;* Columbia, *A. L. Grant;* Bodfish, Kern Co., *Peirson* 10,685. Coast Ranges: Sisson, *Jepson* 13,539; Hayfork Mt., Trinity Co., *Tracy* 6449; Three Creeks to Willow Creek, n. Humboldt Co., *Jepson* 1976; Buck Mt., Humboldt Co., *Tracy* 2820; ne. Lake Co., *Jepson* 9018 (Houghs Sprs.), 8996 (Indian Valley); Mt. Hanna, Lake Co., *Jepson* 13,544; Santa Cruz Mts. w. of Los Gatos, *Heller* 7427; Burro trail, Santa Lucia Mts., *K. Brandegee;* Chorro Creek, San Luis Obispo, *Eastwood.* S. Cal.:

Rosamond, *Davy* 2247; Newhall, *Davidson;* Murietta, w. Riverside Co., *Munz & Johnston* 5336; Descanso, San Diego Co., *Parish* 4524.

Refs.—LINUM MICRANTHUM Gray, Proc. Am. Acad. 7:333 (1868), type loc. Mt. Bullion, Mariposa Co., *Bolander;* Jepson, Fl. W. Mid. Cal. 244 (1901), ed. 2, 240 (1911), Man. 587 (1925). *Hesperolinon micranthum* Small, N. Am. Fl. 25:85 (1907).

9. **L. clevelandii** Greene. CAÑON FLAX. Stem repeatedly dichotomous, usually at or above the middle, ½ to 1½ feet high, glabrate; leaf-blades oblong-lanceolate, 2 to 7 lines long, without stipular glands; flowers minute, on filiform pedicels 1 to 8½ lines long; sepals oblong-lanceolate, entire or microscopically glandular-ciliate; petals yellow, narrowly obovate, ¾ to 1½ (or 2) lines long, toothed on each side at base and with a median erect scale; basal connection of the stamens forming a narrow scarious membrane more or less toothed or lobed between the filaments; capsule equaling or somewhat longer than the calyx.

Brushy hillslopes or cañon sides, 1000 to 3500 feet: North Coast Ranges from Napa Co. to Lake Co. June-July.

Locs.—Howell Mt., Napa Co., *Tracy* 2218; Butts Cañon near Aetna Sprs., Napa Co., *K. Brandegee;* Cobb Mt., Lake Co., *M. S. Baker* 2305e.

Var. **petrophilum** Jepson var. n. Sepals oblong, scarious-margined, not glandular; petals deeply notched at apex, the median basal appendage obsolete.—(Sepala oblonga, scarioso-marginata, eglandulosa; petala apice profunde serrata, basi sine appendiculis.)—Amongst broken rock, summit of Red Mt., northern Mendocino Co., *Jepson* 16,515 (type).

Refs.—LINUM CLEVELANDII Greene, Bull. Torr. Club 9:121 (1882), type loc. Allens Sprs., n. Lake Co., *Cleveland;* Jepson, Man. 586 (1925). *Hesperolinon clevelandii* Small, N. Am. Fl. 25:85 (1907). Var. PETROPHILUM Jepson.

10. **L. adenophyllum** Gray. Stem 11 to 14 inches high, usually unbranched below, repeatedly forked above and forming a widely branched panicle, more or less puberulent; leaf-blades alternate or the lowest opposite, narrow-lanceolate, 3 to 7 lines long, sessile and clasping at the subcordate base, the margin conspicuously stipitate-glandular; flowers on very slender pedicels 1 to 5 lines long; petals yellow or yellowish-white, 2 lines long, appendages pubescent, the central one oblong, the lateral ones much smaller; filaments abruptly dilated and 2-toothed at base; capsule as long as the ovate-lanceolate sepals.

Brushy hills, 2500 to 4500 feet: Mendocino and Lake Cos. June.

Locs.—Potter Valley trail to Redwood Valley, *R. M. Holman;* Mt. Sanhedrin summit, *Heller* 5931; Big Horse Mt., nw. Lake Co., *Jepson* 13,529; Bartlett Mt., *Curran;* Mt. Hanna, Lake Co., *Jepson* 13,530.

Refs.—LINUM ADENOPHYLLUM Gray, Proc. Am. Acad. 8:624 (1873), type loc. Clear Lake, Lake Co., *Bolander;* Jepson, Fl. W. Mid. Cal. 244 (1901), ed. 2, 240 (1911), Man. 586 (1925). *Hesperolinon adenophyllum* Small, N. Am. Fl. 25:85 (1907).

11. **L. drymarioides** Curran. FOOTHILL FLAX. Stem rather widely dichotomous from a little below the middle, 7 to 10 inches high; thinly pubescent or in part glabrous; leaf-blades ovate, glandular-denticulate on the margin, sessile, 2 to 4 lines long; flowers in small terminal clusters or solitary along the branches or in the forks; sepals narrowly ovate, acuminate, cuspidate; petals ovate, rose-color, 1 to 1¼ lines long; lateral scales broadly oblong, deflexed, the central scale minute, with a broad very shallow pit above it; capsule shorter than the calyx.

Foothills: southwestern Colusa Co.; known only from the original collection. July-Aug.

Tax. note.—The habit of this species is quite similar to that of L. adenophyllum. The pubescence of the stems is not properly described as "villous" but is of the same character as that in L. adenophyllum, though slightly more obvious, that is to say it is spreading-hirsute, mostly rather thin and chiefly or often wholly near the forks. The leaves are broader than in L. adenophyllum and not, perhaps, as distinctly subcordate; they are minutely white-dotted beneath as in L. adenophyllum.

Refs.—LINUM DRYMARIOIDES Curran, Bull. Cal. Acad. 1:152 (1885), type loc. Eppersons sta., Williams-Bartlett Sprs. road, sw. Colusa Co. (not "Lake Co."), *Curran;* Jepson, Man. 586 (1925). *Hesperolinon drymarioides* Small, N. Am. Fl. 25:84 (1907).

OXALIDACEAE. Oxalis Family

Ours low herbs with sour juice. Leaves palmately 3-foliolate, alternate or the basal opposite. Flowers borne in peduncled cymes or solitary, complete, regular, symmetrical, 5-merous. Ovary superior, 5-celled; styles 5, distinct. Fruit a loculicidal capsule.—Genera 7 and species about 350, all continents, some in temperate regions but chiefly in the tropics.

Bibliog.—Trelease, W., Oxalideae [of N. Am.], (Mem. Bost. Soc. Nat. Hist. 4:86–98,—1888); Small, J. K., Oxalidaceae in N. Am. Fl. 25:25–58 (1907).

1. **OXALIS** L. Wood Sorrel

Leaflets obcordate, closing and drooping at night. Peduncles axillary, 1 to several-flowered. Sepals imbricated. Stamens 10 in two sets of 5 each, the longer set alternate with the petals; filaments somewhat dilated and united at base. Glands none. Capsule membranous, 5-celled, more or less 5-lobed, the cells opening on the dorsal sutures through which the seeds are explosively ejected, the valves remaining attached to the axis by the partitions. Seeds 2 to several in each cell, transversely, regularly and sharply lineate.—Species about 300, all continents, chiefly in subtropical regions. (Greek oxus, sour, the juice containing oxalic acid.)

Leaves alternate on the stem; flowers yellow.
Filaments glabrous; leaves with hairy stipules; flowers homomorphic (styles and stamens of one form)..........1. *O. corniculata.*
Filaments pubescent; leaves without stipules, the petioles merely scarious-margined at base; flowers trimorphic (styles and stamens reciprocally of three forms)..2. *O. suksdorfii.*
Leaves all basal; flowers pink, white or rose-color.
Scapes commonly 1-flowered; petals 9 to 12 lines long..........3. *O. oregana.*
Scapes commonly 3 to 6-flowered; petals 3 to 6 lines long..........4. *O. trilliifolia.*

1. **O. corniculata** L. Yellow Sorrel. Stems slender, several to many from the crown of a tap-root, ascending, 3 to 6 inches high, or decumbent and often rooting at the nodes, 3 to 12 inches long; herbage villous, sometimes scantily so; leaflets 3 to 6 lines long, on slender petioles with small villous stipules; peduncles axillary, elongated, bearing 2 or 3 flowers; petals yellow; styles longer than or equaling the longer stamens; capsules linear, 6 to 8 lines long, many-seeded.

Moist valleys, dry hillslopes and cañons, 10 to 2000 feet: along the coast from Del Norte Co. to San Diego Co., rarely in the interior. More or less cosmopolitan, especially in the tropics. Apr.-Oct.

Biol. note.—The plant soon develops a stout perennial taproot from the crown of which many stems are usually produced. If the stems are trailing or decumbent, under favorable conditions they may root at the nodes and thus become stolons. In general habit and in morphologic detail our plants throughout the coastal region are alike; they represent one unit. Pedicels may be erect, spreading or deflexed, even on one individual. Capsules may be a little longer or very much shorter than the pedicels, even on one individual. The filaments are united for about one-half their length, although the proportion varies insensibly. The hairiness is inconstant. The stipules do not differ. While often a weed in lawns or gardens, it is frequently found in situations where we regard it as a native plant. All the stations cited below, save Santa Cruz, are thought to represent indigenous habitats. We exclude Oxalis wrightii Gray from California, as does J. K. Small (N. Am. Fl. 25:54), but on wholly different grounds.

Locs.—La Junta near Jamul, *Newlon* 344; La Mesa, w. San Diego Co., *Jepson* 6680; Pala, *Parish* 4397; Oceanside, *Parish* 4442; Fish Cañon, San Gabriel Mts., *Peirson* 2126; Sycamore Cañon, Santa Lucia Mts., *Jepson* 9161; Santa Cruz Isl., *T. Brandegee;* Lucia, Santa Lucia Mts., *Jepson* 1669; Capitola, Santa Cruz Co., *Pendleton;* San Francisco, about 1791, *Menzies* (Cal. Hist. Soc. Quar. 2:289); Potter Valley, Mendocino Co., *Nettie Purpus;* Eureka, *Tracy* 5119; Requa, Del Norte Co., *Davy* 5903b; Butte Creek, e. of Chico, *R. M. Austin* 204.

Var. **atropurpurea** Planch. Stems and foliage deep red-purple.—Native of Europe, sometimes used in gardens for bedding and thus an escape: Berkeley; San Bernardino.

Refs.—Oxalis corniculata L. Sp. Pl. 435 (1753), type from Italy; Jepson, Fl. W. Mid. Cal. 245 (1901), ed. 2, 241 (1911), Man. 588 (1925); Parish, Muhl. 3:4 (1907). *O. wrightii* Jepson, Man. 588 (1925) and other Cal. authors, not Gray. *Xanthoxalis californica* Abrams, Bull. Torr.

Club 34:264 (1907), type loc. Onofre Mts., *Abrams* 3274. *O. pilosa* Nutt.; T. & G. Fl. 1:212 (1838), type loc. Santa Barbara, *Nuttall*. *Xanthoxalis pilosa* Small, N. Am. Fl. 25:54 (1907). Var. ATROPURPUREA Planch. Fl. Serres 12:t. 1205 (1857); Jepson, Man. 588 (1925).

2. **O. suksdorfii** Trel. Stems trailing or decumbent, these and the stolons arising from the crown of a taproot, ½ to 1 foot long; herbage thinly pilose, or the leaflets subglabrous except for the ciliate margins; leaflets ½ to 1 inch wide; peduncles 2 (or 3)-flowered; pedicels 8 to 11 lines long; sepals obtuse; petals bright yellow, 7 to 8 lines long; flowers of 3 kinds as to styles and stamens: (a) short stamens about half the length of the long stamens, the styles intermediate; (b) short and long stamens nearly equal, half as long as the styles; (c) styles shorter than the short stamens; capsule oblong, 5 lines long.

Shady woods, 1000 to 2000 feet: northern Humboldt Co. North to Washington. July-Aug.

Locs.—Berrys Mtn., Redwood Creek, *Tracy* 8796. Oregon: Tamba Ranch, Chetco River, Curry Co., *Jepson* 9366a, *Tracy* 5897.

Refs.—OXALIS SUKSDORFII Trel. Mem. Bost. Soc. Nat. Hist. 4:89 (1888). *O. pumila* Nutt.; T. & G. Fl. 1:212 (1838), type loc. "forests of the Rocky Mts. and Oregon", *Nuttall;* not O. pumila Urv. (1826). *Xanthoxalis suksdorfii* Small, N. Am. Fl. 25:53 (1907).

OXALIS CERNUA Thunb. Diss. Oxalis 14 (1781), type from South Africa. Root-stocks bearing bulblets at the nodes; petals bright yellow, ¾ to 1¼ inches long.—Occasionally escaped from gardens to cultivated fields.

3. **O. oregana** Nutt. REDWOOD SORREL. Scapes and leaves from a creeping rootstock; leaflets pubescent or subglabrous, the scapes and petioles more or less rusty-villous; scapes 2 to 7 inches high, 2-bracted near the top, commonly 1-flowered; leaflets broadly obcordate, broader than long, 1 to 1½ inches long; petals oblong-obovate, slightly retuse or obtuse, pink, white, lavender or rose-color, often veined with purple, 9 to 12 lines long; styles exceeding the long stamens; capsules obovoid to round-ovoid, 3 to 6 lines long.

Shady woods, 50 to 2000 feet: Redwood belt from the Santa Lucia Mts. to Del Norte Co. North to Washington. Mar.-May.

Biol. note.—Oxalis oregana is one of the most characteristic plants of the forest floor under Redwood. There is a mean of shade which is most agreeable to it and where, often, it forms pure carpets of great extent. In such situations the leaflets stand horizontally at mid-day, but where a break in the canopy permits sunlight the leaflets fold down on their midribs parasol-like. In extremely dense Redwood stands 250 to 300 feet high the species is sometimes absent. The anthers of the five short stamens are borne opposite the yellow dots on the lower part of the petals and thus stand over the entrance way to the honey-gland which lies in the creased or channeled claw. The margins of the claws are connivent.

Locs.—Lucia, Monterey Co., *Jepson;* Little Sur River, Monterey Co., *Davy* 7315; Greninger Creek, w. of Gilroy, *Jepson* 9686; Big Basin, Santa Cruz Mts., *Jepson;* Kings Mt., San Mateo Co., *C. F. Baker* 325; Mill Valley, Mt. Tamalpais, *Jepson* 13,547; Papermill Creek, Marin Co., *Jepson* 10,310a; Pt. Reyes, *Greene;* Comptche, *H. A. Walker* 269; Willits, *Docia Patchett;* Hubbards sta., Humboldt Co., *Jepson;* Wilder Ridge, Humboldt Co., *Jepson;* Bull Creek, Humboldt Co., *Jepson* 16,432; High Prairie Creek near Bald Mt., Humboldt Co., *Tracy* 4940; Nobles Ranch, New River, *Jepson;* Mud Spr. near Hupa, *Jepson.*

Var. **tracyi** Jepson. Petals white, often veined with pink, relatively narrow, obtuse, 4 to 7 lines long.—Humboldt Co. and north to Curry Co., Oregon.

Refs.—OXALIS OREGANA Nutt.; T. & G. Fl. 1:211 (1838), type loc. shady woods of the Columbia River, *Nuttall;* Jepson, Fl. W. Mid. Cal. 246 (1901), ed. 2, 241 (1911), Man. 588, fig. 582 (1925). *O. macra* Small, N. Am. Fl. 25:26 (1907), type loc. Santa Lucia Mts., *R. A. Plaskett.* Var. TRACYI Jepson, Man. 588 (1925), type loc. Tamba Ranch, Chetco River, sw. Ore., *Jepson* 9366.

4. **O. trilliifolia** Hook. COLUMBIA OXALIS. Scapes and leaves all basal from a fleshy-scaly rootstock; scapes as long as the leaves, 5 to 10 inches high, umbellately 3 to 6-flowered; leaflets thin, 1 to 1½ inches long; petals nearly white, deeply notched, 3 to 6 lines long; styles longer than the long stamens; capsules linear, 10 to 15 lines long.

Montane meadows, or along streamlets, 500 to 6000 feet: northern Humboldt Co. North to Washington. May-June.

Locs.—Murphy Mdws., Bald Mt., acc. *Tracy;* Prairie Creek, *Tracy* 7499; Trinity Summit, *Manning* 37. Ore.: Mt. Hood, *Keck* 317.

Refs.—OXALIS TRILLIIFOLIA Hook. Fl. Bor. Am. 1:118 (1830), type loc. high mts. near the grand rapids of the Columbia River, *Douglas;* Jepson, Man. 588 (1925). *Hesperoxalis trilliifolia* Small, N. Am. Fl. 25:27 (1907).

GERANIACEAE. GERANIUM FAMILY

Ours herbs with lobed and divided leaves and scarious stipules. Flowers complete, regular, symmetrical, 5-merous. Sepals persistent. Petals deciduous. Stamens as many or twice as many as the petals. Ovary superior, 5-celled, deeply lobed, the 5 styles united around the elongated axis (prolongation of the receptacle) and free only at tip. Fruit of 5 one-seeded carpels separating elastically when ripe from the central persistent axis and bearing the twisted or spirally coiled styles as tails.—Genera 5 and species about 600, temperate and subtropical regions of all continents.

Bibliog.—Trelease, W., A study of N. Am. Geraniaceae (Mem. Bost. Soc. Nat. Hist. 4:71–103, pls. 9–12,—1888). Knuth, R., Geraniaceae (Engler, Pflzr. 4^{129}:1–640, figs. 1–80,—1912).

Stamens with anthers 10; leaf-blades palmately parted; styles in fruit nearly glabrous inside........ 1. GERANIUM.
Stamens with anthers 5; leaf-blades pinnatifid or pinnate, or roundish-cordate; styles in fruit bearded inside........2. ERODIUM.

1. GERANIUM L. CRANESBILL

Herbs with forking stems, swollen nodes and stipulate leaves with palmately parted blades. Peduncles axillary, umbellately 2 or 3-flowered, or 1-flowered. Flowers regular, 5-merous, the sepals imbricate in the bud. Stamens 10, sometimes slightly connate at base, all with perfect anthers, the 5 longer alternate with the petals and with glands at their base. Styles in fruit nearly glabrous inside. Cotyledons plicate, incumbent on the caulicle.—Species about 250, temperate regions of both hemispheres and mountains of the tropics. (Greek geranos, a crane, from the elongated fruit-bearing beak.)

Petals 1 to 2½ (or 3) lines long, little or not at all exceeding the calyx; stems leafy.
  Carpels hairy; stems (especially the lower part) usually retrorsely pubescent.
    Perennial; seeds superficially reticulate; pubescence glandless........1. *G. pilosum.*
    Annuals.
      Inflorescence usually glandless; flowers light pink; leaf-divisions broad; seeds reticulated........2. *G. carolinianum.*
      Inflorescence more or less glandular; flowers purple; leaf-divisions narrow; seeds regularly pitted........3. *G. dissectum.*
  Carpels glabrous, transversely wrinkled; seeds smooth; stems and petioles pilose-spreading, the hairs sometimes glandular; annual........4. *G. molle.*
Petals 4½ to 10 lines long, much exceeding the calyx; carpels and beaks glandular-pubescent; seeds very minutely roughened; perennials.
  Leaves all basal; San Bernardino Mts........5. *G. caespitosum.*
  Stems leafy; widespread in the higher mts.
    Petals pink; hairs of pedicels sometimes tipped with yellowish glands........6. *G. incisum.*
    Petals white; hairs of pedicels tipped with purple glands........7. *G. richardsonii.*

1. **G. pilosum** Forst. TRAVELERS GERANIUM. Stems slender, leafy, branching, arising from a thick root-crown, 1 to 1¾ feet high; stems and petioles retrorsely hispidulose, the leaves hispidulose; leaf-blades ½ to 1 inch wide, incisely 3 or 5-parted, the cuneate segments more or less deeply toothed or cleft; peduncles variable (1 line to 1¼ inches long), shorter or longer than the pedicels, 2-flowered; petals deep purple, 1 to 2 lines long; carpels dark brown or black, somewhat sparsely hairy.

Native of Australasia, sparingly naturalized along the coast, 10 to 300 feet. May-June.

Locs.—Trinidad sta., Humboldt Co., *Tracy* 3238; Inverness, Marin Co., *Eastwood;* Mt. Tamalpais, *T. Brandegee;* Berkeley, *Jepson* 9072.

Var. **retrorsum** Jepson. Pubescence of stem retrorsely strigose.—Introduced from Australasia: Presidio, San Francisco, *Bioletti;* Blue Lake, Humboldt Co., *Tracy* 2990.

Refs.—GERANIUM PILOSUM Forst. Prodr. 91, n. 531 (1786), type from New Zealand; Jepson, Man. 589 (1925). Var. RETRORSUM Jepson, l.c. *G. retrorsum* L'Her.; DC. Prod. 1:644 (1824), type from New Zealand.

2. **G. carolinianum** L. CAROLINA GERANIUM. Stems branching, erect or ascending, 7 to 14 inches high; herbage pubescent; leaf-blades palmately 5 to 7-parted, the cuneate segments more or less incisely dissected or toothed, the ultimate segments rather broad; peduncles commonly shorter than the petioles; inflorescence usually not glandular; flowers about 3 lines long; petals light pink; beak or fruit loosely villous, sometimes glandular; carpels hairy, usually black; seeds typically oblong with shallow reticulations.

Open fields or hill slopes, 100 to 4000 feet: throughout California except in the deserts. East to the Atlantic. Mar.-May.

Locs.—Santa Ana Mts., *Alice King;* San Bernardino, *Parish;* Monrovia Cañon, San Gabriel Mts., *Peirson* 437; Kaweah, *Hopping* 277; San Luis Obispo Co., *Summers;* Yosemite Valley, *Abrams* 4637; Hetch-Hetchy, *Jepson* 3430; Berkeley, *Jepson* 13,563, 13,566; Placerville, *Rattan* 42; Marysville Buttes, *Jepson,* 13,567; Cloverdale, *Bolander* 3845; Laytonville, Mendocino Co., *Jepson,* 13,568; Ft. Seward, Humboldt Co., *Tracy* 4436; Sisson, Shasta Co., *Jepson* 13,564; Egg Lake, Modoc Co., *M. S. Baker.*

Var. **longipes** Wats. Stems several from the base, looser, more spreading; peduncles longer than the petioles, spreading; inflorescence loose; petals rose-purple.—Humboldt and Siskiyou Cos., 2500 to 3800 feet. North to British Columbia, east to Maine. July-Aug.

Locs.—Kneeland Prairie, Humboldt Co., *Tracy* 3048; Deetz Sta., Siskiyou Co., *Heller* 11,715.

Refs.—GERANIUM CAROLINIANUM L. Sp. Pl. 682 (1753), type loc. "Carolina, Virginia"; Jepson, Fl. W. Mid. Cal. 246 (1901), ed. 2, 242 (1911), Man. 589 (1925). Var. LONGIPES Wats. Bot. King 50 (1871), type from Great Basin, *Watson* 206. *G. bicknellii* Britt. Bull. Torr. Club 24:92 (1897).

3. **G. dissectum** L. CUT-LEAF GERANIUM. Differing little from no. 2, but the primary lobes of the leaves typically very narrow, with the ultimate divisions mostly slender, somewhat falcate and acute; petals rose-purple; inflorescence and fruit glandular; seeds elliptic, deeply reticulate.

Open fields, grassy vales or borders of brushy slopes, 15 to 2500 feet, naturalized from Europe: Coast Ranges; Amador Co. Feb.-June.

Locs.—Carmel, *Newlon* 137; Alviso, Santa Clara Co., *Jepson* 10,398; Stanford, *C. F. Baker* 860; Mt. Davidson, San Francisco, *Jepson* 10,359, 10,597; Mt. Diablo, *Jepson* 9862; Dry Creek, n. of Ione, *Jepson* 15,223; Alderney, Marin Co., *Jepson* 8268; Hopland, Mendocino Co., *Jepson* 9290; Ft. Bragg, *W. C. Mathews;* Eureka, Humboldt Co., *Tracy* 3006.

Refs.—GERANIUM DISSECTUM L. Cent. 1:21 (1755), type "in Europa australiori"; Jepson, Fl. W. Mid. Cal. 246 (1906), ed. 2, 242 (1911), Man. 589, fig. 583 (1925).

4. **G. molle** L. DOVES-FOOT GERANIUM. Stems slender, several from the base, 12 to 20 inches high; herbage soft-pilose, the leaf-blades hirsute-pubescent; leaf-blades deeply cleft into 5 to 7 broad cuneate segments, the segments toothed or cleft, the basal leaves with petioles 3 to 5 inches long; pedicels widely divergent after flowering; petals rose-pink, cleft at apex, 1½ lines long, with a tuft of hairs at base; carpels glabrous, finely wrinkled transversely, the beak glandular-pubescent.

Introduced from Europe, infrequent: coast region from San Francisco to Del Norte Co. May.

Locs.—San Francisco, *Greene;* Mt. Tamalpais, *Jepson* 7450; Humboldt Bay, *Chandler* 1124; Hydesville, Humboldt Co., *Tracy* 2436; Korbel to Angels Ranch, Humboldt Co., *Jepson* 1933; Gilbert Creek, Del Norte Co., *Jepson* 9352.

Refs.—GERANIUM MOLLE L. Sp. Pl. 682 (1753), type from Europe; Jepson, Man. 590 (1925).

5. **G. caespitosum** James. TUFT GERANIUM. Stems leafy throughout with peduncles in all the axils (or sometimes naked and scape-like), ascending or diffuse,

5 to 16 inches high, these and the basal leaves in a tuft on the thick root-crown; herbage puberulent, the peduncles and petioles retrorsely hairy; leaf-blades 5-parted or -divided, the segments cuneate, deeply toothed or cleft; peduncles 1 or 2-flowered; petals pale, purple-veined, villous within, 4½ to 5 lines long.

Montane, 7000 to 8000 feet: San Bernardino Mts.; San Jacinto Mts. East to New Mexico. June.

Locs.—Bluff Lake, San Bernardino Mts., *Parish* 3784; Bear Valley, San Bernardino Mts., *Parish* 1806; Tahquitz Valley (Zoe 4:162).

Refs.—GERANIUM CAESPITOSUM James; Long Exped., Am. ed., 2:3 (1823), type loc. sandstone ledges at base of the Rocky Mts., vicinity of the Platte River, *James;* Jepson, Man. 590 (1925).

6. **G. incisum** Nutt. WOODLAND GERANIUM. Stem 1 to 2 feet high, from a stout often branched root-crown; leaf-blades appressed-hirsute, the petioles pilose, sometimes retrorsely pubescent, the stems and pedicels pilose, the hairs sometimes tipped with yellow glands; blades of basal leaves on petioles 6 to 11 inches long, deeply parted into usually 5 segments which are again cleft or deeply toothed; blades of cauline leaves short-petioled, parted into usually 3 segments; petals pink or purple, hairy inside, 5 to 10 lines long.

Open woods of mountain valleys and cañon flats, 2500 to 7000 feet: Humboldt Co. to Siskiyou Co.; Sierra Nevada from Tulare Co. to Modoc Co. North to British Columbia. June-Aug.

Locs.—North Coast Ranges: Yager Creek (head of), Humboldt Co., *M. S. Baker* 30; Willow Creek, Trinity River, *Tracy* 3287; Hupa, *Manning;* Quartz Valley, Siskiyou Co., *Butler* 1458; Sisson, *Jepson* 13,570. Sierra Nevada: Bearskin Mdw., Grant Park, *Newlon* 220; Big Mdw. near Macauley, Mariposa Co., *Jepson* 13,571; Gin Flat, 2 mi. e. of Crane Flat, Mariposa Co., *Jepson* 10,508; Yosemite, *Jepson* 3123b, 13,569; Goose Lake Valley, Modoc Co., *Austin & Bruce* 2259; Blue Lake, Warner Mts., *L. S. Smith.*

Refs.—GERANIUM INCISUM Nutt.; T. & G. Fl. 1:206 (1838), type loc. "Vallies of the Rocky Mountains and Oregon", *Nuttall,* as a synonym; Jepson, Man. 590 (1925). *G. hookerianum* var. *incisum* Walp. Rep. 1:450 (1842).

7. **G. richardsonii** F. & T. LITTLE-DICK GERANIUM. Stem rather slender, from a stout simple or branched root-crown, 1½ to 2¼ feet high; leaf-blades somewhat appressed-pubescent, the stems and petioles pilose or hirsute with spreading hairs, sometimes retrorsely so; blades of basal leaves deeply 5-parted into toothed or cleft segments, the petioles 3 to 12 inches long; hairs of the pedicels tipped with purple glands; petals white, sometimes pink-tinted, mostly roseate-veined, hairy within, 5 to 6 lines long.

Moist mountain meadows or openly wooded cañons, 5500 to 9000 feet: high mountains of Southern California; Sierra Nevada from Tulare Co. to Lassen Co.; Humboldt Co. at 800 feet. East to New Mexico, north to Saskatchewan. July.

Geog. note.—In Southern California the purple-flowered forms cannot otherwise be distinguished from the usual white form of G. richardsonii, especially its prevailing form in the Sierra Nevada. The pubescence of petioles may be either spreading or deflexed or retrorse in either G. richardsonii or G. incisum, while the glandular character is variable in both species. As G. incisum, entering California from the north, ranges southward in the Sierra Nevada it becomes less coarse, less glandular and tends to approximate G. richardsonii in slenderness and in smaller flowers.

Locs.—S. Cal.: Tahquitz Valley, San Jacinto Mts., *Jepson* 2299; Green Valley, San Bernardino Mts., *Chandler;* Big Pines, San Gabriel Mts., *Peirson* 3185 (petals purple). Sierra Nevada: Hockett Mdw., Tulare Co., *Culbertson* 4382; Huckleberry Mdw., Giant Forest, *Newlon* 51; Bubbs Creek, South Fork Kings River, *Jepson* 779; Simpson Mdw., Middle Fork Kings River, *Henrietta Eliot;* Huntington Lake, *E. Ferguson* 392; Rancheria Mt., Tuolumne Co., *Jepson* 4602; Herring Creek, Tuolumne Co., *A. L. Grant* 81; Kennedy Mdws., upper Stanislaus River, *Jepson* 6539; Dorrington, Calaveras Co., *Jepson* 10,194; Martin Sprs., Eagle Lake, *Brown & Wieslander.* Humboldt Co.: Willow Creek, Trinity River, *Tracy* 3287.

Refs.—GERANIUM RICHARDSONII F. & T. Ind. Sem. Hort. Petrop. 4:37 (1837); Jepson, Man. 590, fig. 584 (1925). *G. albiflorum* Hook. Fl. Bor. Am. 1:116 (1830), type loc. "Valleys in the Rocky Mountains", Canada, *Drummond;* not G. albiflorum Ledeb. (1831). *G. hookerianum* Walp. Rep. 1:450 (1842).

2. **ERODIUM** L'Her. Storksbill

Annual herbs. Leaves opposite, often unequal, either simple or pinnate, with one interpetiolar stipule on one side and two on the other. In vegetative characters very similar to Geranium; the flower and fruit nearly the same, but the stamens with anthers 5 only, the alternate filaments sterile and scale-like. Styles bearded inside. Pedicels after anthesis commonly retrocurved.—Species 60, all continents but chiefly in the Mediterranean region. (Greek erodios, a heron.)

Alien Erodium immigrants.—The first species of this genus entering California as an immigrant from the Old World was Erodium cicutarium L'Her. It is almost undoubted that it came with the earliest European settlements, that is, from Spain by way of Mexico. By 1844 it was abundant in the Great Valley (Fremont, Rep. Expl. Exped. to Ore. and n. Cal. 243, 253), and by the early days of the American occupation of the state it was widely diffused through all the open lowland country. It occurs not only in the fields and open hills of coastal Southern California, the Coast Ranges, Sierra Nevada foothills and Great Valley, but it has adapted itself to the most arid parts of the Mohave Desert where it is found everywhere on flats, uplands and mesas. Probably no other species is represented in the Mohave Desert at the present time by so large a number of individuals as Erodium cicutarium. In the desert (as elsewhere) its seed germinates readily under slight rainfalls; it develops promptly a deep-seated taproot; and under unfavorable conditions for growth, plants which do not rise above one-half to one inch in stature may flower and produce seed. A severe habitat of another kind, geographically distant, is represented by the moist sea-beaches of Mendocino County, where on account of adverse temperature and soil conditions the prostrate plants are seldom above two to three inches in diameter. But everywhere in the intermediate habitats, the low open foothills and semi-arid valleys, the plant is much at home and often forms 25 to 40 per cent of the ground cover. Highly esteemed as a forage plant it is one of comparatively few unbidden aliens that represent an economic asset and not a disadvantage as a pest or weed. Its wide distribution is undoubtedly associated with the nature of its preferred habitat, the open grasslands, and the flocks of sheep which from the earliest days of Spanish-California have grazed them.

Erodium moschatum L'Her. was the second species to appear. It may have come in with E. cicutarium at the founding of the Spanish missions, but of the two, the latter became by far the more widely distributed. Keeping mainly to the coastal valleys, Erodium moschatum is on the whole rather restricted in habitat. It is chiefly a plant of cultivated ground and is abundant only in rich lands of valley orchards, vineyards and gardens, where it is commonly the sole species of this genus. Often growing very rankly in good soils we have recorded occasional plants with stems 5 to 6 feet long and leaves 14 to 15 inches long. On account of its musky foliage it is less valued as stock feed than the Red-stem Filaree.

It was nearly a century later that Erodium botrys Bertol. appeared in California. We first noticed it in Vaca Valley in 1885, though one station had been recorded previously in the Botany of the California Geological Survey (1:95,—1876). Since that time it has spread steadily and persistently and seems to displace Erodium cicutarium as it advances. Its rosettes of leaves are formed in winter or early spring, lie flat on the ground and protect the plant from too close competition. Biologically it possesses a more effective rosette than E. cicutarium, because shading the ground more completely. Its aggressive behavior has been studied by us at many places in the Sierra Nevada foothills and indicates wide-spread and successful occupation of the open gravelly and clay plains and lower hills where it has displaced Erodium cicutarium. About Table Mountain in Fresno Co. it formed in 1929 from 20 to 60 per cent of the ground cover on most of the pastured hills. In the region of Ione, the same year, on the low rolling plains it formed over vast areas 50 to 90 per cent of the cover (Jepson Field Book 49:119, ms.). In 1927 similar observations were made in the foothills of the upper Sacramento Valley. On the low rolling plains of western Tehama Co., E. cicutarium was in 1899 the only observed species (Jepson Field Book 1:146, ms.). In 1929, on the contrary, E. botrys was often the dominant in that upper valley region. All this illustrates well the march of an immigrant, the conquest of the grassy foothills by alien populations from the region of the Mediterranean.

Sepals not bristle-tipped; leaf-blades mostly cordate or subcordate at base.
  Leaf-blades round-ovate to oblong-ovate, sub-palmately cleft or parted............1. *E. texanum.*
  Leaf-blades cordate-reniform, crenately toothed or shallowly lobed..........2. *E. macrophyllum.*
Sepals bristle-tipped or setose-tipped; leaf-blades oblong or oblong-ovate, not cordate at base, pinnatifid or pinnately divided into toothed or cleft lobes.
  Leaf-blades oblong-ovate, pinnately cleft into broad crenate lobes; beak of fruit 2¼ to 5 inches long; sepals bristle-tipped; glands of the flowers greenish..........3. *E. botrys.*
  Leaves pinnate; beak of fruit 1 to 1¾ inches long; glands of the flowers reddish or brownish.
    Leaflets serrate or merely incised; petals with naked claws; sepals without bristles or sometimes tipped with 1 or 2 short setose hairs; stipules large, obtuse................ 4. *E. moschatum.*
    Leaflets pinnatifid; petals with ciliate claws; sepals tipped with 1 or 2 long bristle-like hairs; stipules commonly small and acute....................................5. *E. cicutarium.*

1. **E. texanum** Gray. Stems caespitose, several from the base, leafy, 1½ to 11 inches long; herbage canescently appressed-pubescent, without glandular hairs; leaf-blades round-ovate to oblong-ovate, cordate to subcordate at base, subpalmately lobed or divided, dentate, 4 to 11 lines long; flowers in clusters of about 3; sepals oblong, abruptly mucronate, silvery with appressed pubescence, purple-veined; petals purple, 7 to 9 lines long on the earliest flowers, on the late ones greatly reduced or suppressed; carpels rather sparsely hairy, the beak scabrous, appressed-pubescent.

Sandy soil, –200 to 2500 feet: Colorado and Mohave deserts; San Carlos Range. East to Texas. Apr.-May.

Locs.—San Felipe Narrows, e. San Diego Co., *C. V. Meyer* 38; Mecca, *Parish* 8477; Calico Wash, Barstow, *Jepson* 5817; Alcalde (Zoe 4:150).

Refs.—Erodium texanum Gray, Gen. Ill. 2:130, pl. 151 (1849), type loc. "Texas", *Lindheimer, Wright;* Jepson, Man. 591 (1925).

2. **E. macrophyllum** H. & A. Peduncles and leaves basal or sub-basal, 3 to 12 inches high; herbage puberulent; leaf-blades reniform-cordate, crenate and often shallowly lobed, 1 to 2 inches broad; umbels mostly 2 or 3-flowered; petals white, 5 to 8 lines long, little exceeding the broad sepals; filaments conspicuously orbicular-dilated at base; mature carpels densely silky-hairy, truncate at top, 4 lines long.

Open fields or hillslopes, 50 to 3500 feet: Great Valley (w. side); South Coast Ranges; coastal Southern California. Apr. An extremely rare plant, both as to stations and individuals.

Locs.—Willows, Glenn Co., *Jepson* 13,561; Montezuma Hills, se. Solano Co., *Jepson* 13,562; near Kirker Pass, Contra Costa Co., *Brewer* 1067; Orestimba Cañon, w. Stanislaus Co., *Brewer* 1280; Monterey Co., *Plaskett;* Tehachapi, *Heller* 7831; Elizabeth Lake, Los Angeles Co., *Parish* 1906; Alice Mine, Riverside Co., *Hall* 523.

Var. **californicum** Jepson. Taller, branching, 12 to 16 inches high; herbage puberulent and also beset with gland-tipped hairs; leaves 2 to 3½ inches broad; umbels frequently 5 or 6-flowered; petals deep rose-red or purple.—Alameda Co. to Los Angeles Co.

Locs.—Oakland Hills, *Blasdale;* Santa Cruz Isl., *T. Brandegee;* Santa Monica Mts., *Hall* 3264.

Refs.—Erodium macrophyllum H. & A. Bot. Beech. 327 (1840), type from Cal.; Jepson, Fl. W. Mid. Cal. 247 (1901), ed. 2, 242 (1911), Man. 591 (1925). Var. californicum Jepson, ll.cc. *E. californicum* Greene, Fl. Fr. 99 (1891), type loc. "Berkeley Hills and eastward in the Mt. Diablo Range"; Brandegee, K., Zoe 4:86 (1893).

3. **E. botrys** Bertol. Stems leafy, branching from the base, commonly prostrate, but sometimes erect, ½ to 2½ feet long; herbage coarsely white-pubescent; leaf-blades 1 to 4 inches long, on petioles as long or twice as long, oblong-ovate, pinnatifid, the lobes serrate, acute; sepals short-pointed and tipped with 1 or 2 short bristles; petals deep violet or rose-color, 3½ to 4½ lines long; glands greenish; filaments dilated nearly to apex and toothed; beak of fruit 2¼ to 5 inches long.

Mediterranean plant, widely naturalized on low pastured hills and rolling gravelly plains almost throughout California at low altitudes. Apr.-May.

Biol. note.—The leaves of the seedling or young plant are commonly elliptic or oblong and merely serrate, or sometimes with 1 or few clefts, 4 to 11 lines long. In unfavorable situations or in dry seasons plants may produce only this type of leaf, though coming finally into reproductive maturity (Gilroy, *E. Ferguson* 300; Rock Spr., Mt. Tamalpais, *Jepson* 7563).

Locs.—Marysville Buttes, *Jepson* 13,555; White Thorn Valley, Humboldt Co., *Tracy* 5026; Mills sta., n. Sacramento Co., *Jepson* 15,736; Vacaville, *Jepson* 13,554; St. Helena, *Jepson* 6268, 9884; Ross Valley, Marin Co., *Jepson* 13,553; Rock Spr., Mt. Tamalpais, *Jepson* 7563; Gwin Mine, Calaveras Co., *Jepson;* Clements, San Joaquin Co., *Jepson* 15,202; Brentwood, *Linda Gehringer;* Redwood Peak, Oakland Hills, *Jepson;* San Francisco, *Jepson* 13,556; Gilroy, *E. Ferguson* 300; Hodgdon Ranch near Tuolumne Grove, *Jepson* 10,542a; La Grange, e. Stanislaus Co., *Jepson;* Sparkville, near Aubrey, Fresno Co., *Jepson* 15,142; Selma, Fresno Co., *Kate Stirring;* Palomar, San Diego Co., *Jepson* 12,439.

Refs.—ERODIUM BOTRYS Bertol. Amoen. Ital. 35 (1819); Jepson, Fl. W. Mid. Cal. 247 (1901), ed. 2, 243 (1911), Man. 591, fig. 585 (1925). *Geranium botrys* Cav. Diss. 4:218 (1787) type loc. "in arenosis prope mare Hispanicum et Lusitanicum, atque in pratis Neapolitanis".

4. **E. moschatum** L'Her. WHITE-STEM FILAREE. MUSK CLOVER. Leaves at first forming a close rosette on the ground, later with stout fleshy ascending leafy stems ½ to 1½ feet high; herbage hirsute with scattered spreading hairs; leaves 2 or 3 inches to 1½ feet long; leaflets ovate to elliptical, serrate and sparsely incised, short-petiolulate, ¾ to 1½ inches long, the terminal cuneately 3 to 5-parted; peduncles much elongated in fruit, 4 to 11 inches long; petals rose-purple, 3 lines long, with short claws; filaments membranously winged at base, with upwardly pointing teeth; beak of the fruit 1½ to 1¾ inches long.

Naturalized from Europe, chiefly in rich loams or clay soils almost throughout cismontane California at low altitudes. Mar.-Apr.

Locs.—Eureka, *Tracy* 150; Vaca Valley, *Jepson;* Santa Rosa, *Heller* 5159; Point Reyes, *Davy* 6807; Livermore Valley, *Davy;* Caliente Creek, Kern Co., *Davy* 1931; Los Angeles (Erythea 1:58); San Bernardino, *Parish.*

Refs.—ERODIUM MOSCHATUM L'Her.; Ait. Hort. Kew. 2:414 (1789); Jepson, Fl. W. Mid. Cal. 247 (1901), ed. 2, 243 (1911), Man. 591, fig. 586 (1925). *Geranium moschatum* L. Sp. Pl. 680 (1753), type from Europe.

5. **E. cicutarium** L'Her. RED-STEM FILAREE. Leaves at first forming a close rosette on the ground, later with more or less ascending leafy stems 3 to 12 inches long; leaflets subsessile, nearly oblong, incisely pinnatifid with acute often toothed lobes; petals rose-purple; sepals terminated by 1 or 2 bristle-like hairs; filaments little dilated at base, not toothed; beak of the fruit 1 to 1¼ inches long.

Introduced from the Mediterranean region; barren hillsides or dry plains everywhere, 5 to 4500 feet, chiefly in light or sandy soils. Beginning to flower in February or March, Erodium cicutarium may in many places continue through the summer. Its stems are usually reddish, while those of E. moschatum are commonly white or whitish.

Locs.—Warner Mts., Modoc Co., *L. S. Smith* 1094; Alton, Humboldt Co., *Tracy* 3675; Gwin Mine, Calaveras Co., *Jepson;* Inverness, *Jepson;* Olema, *Jepson* 13,559; Berkeley, *Jepson* 13,557, 13,560; Berryessa, Santa Clara Co., *Davy* 7054; Hetch-Hetchy, *Jepson;* Lemon Cove, *Jepson;* Bakersfield, *Davy;* Daggett, Mohave Desert, *Mary Beal;* San Bernardino, *Parish;* Thomas Valley, San Jacinto Mts., *Jepson* 13,558; San Felipe Wash, e. San Diego Co., *C. V. Meyer* 39; Blair Valley, e. San Diego Co., *Jepson.*

Refs.—ERODIUM CICUTARIUM L'Her.; Ait. Hort. Kew. 2:414 (1789); Parish, Zoe 1:8 (1890); Jepson, Fl. W. Mid. Cal. 248 (1901), ed. 2, 243 (1911), Man. 592, fig. 587 (1925). *Geranium cicutarium* L. Sp. Pl. 680 (1753), type from Europe.

FUGITIVE ALIENS.—The following alien Geraniaceae have been recorded in the literature as occurring in California. Mostly garden plants, they are probably waifs or transients, or plants occurring in protected areas or on garden refuse heaps, and in any event are at the present time, for the most part, little known or unknown to collectors as truly spontaneous competitives. GERANIUM PYRENAICUM Burm. f. Sp. Geran. 27 (1759),—Mt. San Gorgonio, 7000 feet (Bull. S. Cal. Acad. 19^{4}:21). G. DISSECTUM var. GLABRATUM Hook. f. Handb. Fl. New Zeal. 36 (1864),—"California" (N. Am. Fl. 25:10). G. ROTUNDIFOLIUM L. Sp. Pl. 683 (1753),—Sawtelle (Dav. & Mox. Fl. S. Cal. 211). PELARGONIUM GROSSULARIOIDES Ait. Hort. Kew. 2:420 (1789), (*P. anceps* Ait. l.c.),—East Oakland, *Eastwood,* Pt. Arena, *Congdon.* P. CLANDESTINUM A. Cunn. Ann. Nat. Hist. 3:317 (1839),—"Southern California" (N. Am. Fl. 25:23). P. ZONALE L'Her.; Ait. Hort. Kew. 2:424 (1789),—"California" (N. Am. Fl. 25:23). P. INQUINANS L'Her. l.c. (Fish Geranium),—"Southern California" (N. Am. Fl. 25:24). P. CAPITATUM L'Her. l.c. 2:425,—"Southern California" (N. Am. Fl. 25:24). TROPAEOLUM MAJUS L. Sp. Pl. 345 (1753), native of Peru; occasional fugitive from gardens (Greene, Fl. Fr. 99).

LIMNANTHACEAE. MEADOW FOAM FAMILY

Annual herbs with dissected alternate leaves without stipules. Flowers complete, regular, symmetrical, 3 to 6-merous. Calyx of distinct or nearly distinct sepals, persistent, free from the ovary. Petals withering-persistent. Stamens twice as many as the petals. Carpels 5, their bodies distinct but with a common style arising from among them near the base, at length separating from a very short axis as 1-seeded nutlets.—Genera 2 and species 8, North America.

Bibliog.—Brown, R., Characters and description of Limnanthes (Misc. Bot. Works 2:360–364,—1833). Trelease, W., Limnantheae [of N. Am.] (Mem. Bost. Soc. Nat. Hist. 4:84–86,—1888). Rydberg, P. A., Limnanthaceae in N. Am. Fl. 25:97–100,—1910).

Flowers commonly 5-merous, never 3-merous; petals notched at apex, longer than the sepals; cismontane……1. LIMNANTHES.
Flowers 3-merous; petals entire, shorter than the sepals; northern Sierra Nevada, mostly transmontane……2. FLOERKEA.

1. LIMNANTHES R. Br.

Flowers solitary on axillary peduncles, ours 5-merous (exceptionally 4 or 6-merous). Sepals valvate in the bud. Stamens 10, distinct, the filaments alternate the petals with a gland-like swelling at base. Petals with a U-shaped band of hairs on the claw. Stigmas 5, capitate.—Species 7, North America. (Greek limne, marsh, and anthos, flower, in reference to the habitat.)

Basal leaves mostly 3 to 5 inches long or more; corolla commonly somewhat bowl-shaped or subglobose in outline; claw of petals with a dense band of hairs on each side.
  Petals white, or yellow and white-tipped; nutlets smooth or with only a few tubercles at apex; herbage glabrous; Coast Ranges……1. *L. douglasii.*
  Petals white, usually fading (more or less) pinkish or roseate; nutlets with scale-like tubercles, the ridges or plates of the tubercles commonly covered with very minute roundish granules, these granules microscopically scaly on the surface; Great Valley and neighboring foothills.
    Nutlets very densely set all over with thin whitish scales; calyx and herbage glabrous; petals commonly aging pinkish……2. *L. rosea.*
    Nutlets chiefly scaly at summit; herbage more or less pilose; calyx long-hairy, at least inside; petals sometimes rose-tinted at apex……3. *L. alba.*
Basal leaves mostly 1 to 2 inches long; Sierra Nevada foothills mostly.
  Base of petals with a row of hairs on each side; nutlets smoothish but the summit sparsely set with whitish scales; corolla campanulate in outline; petals striately brown-purple-nerved……4. *L. striata.*
  Base of petals without rows of hairs; petals not purple-nerved.
    Corolla sub-campanulate in outline; petals white, broadest towards apex; nutlets warty at summit……5. *L. montana.*
    Corolla somewhat bowl-shaped in outline; petals cream-color with pinkish tips; nutlets entirely smooth or lightly wrinkled……6. *L. versicolor.*

1. **L. douglasii** R. Br. MEADOW FOAM. Stems several from the base, ascending or suberect, 6 to 14 inches high; herbage yellowish-green, succulent, glabrous; leaves pinnately divided, the divisions 3 to 9 and incisely toothed or parted; peduncles at length 2 to 4 inches long; sepals lanceolate, 2 to 4 lines long; petals white (or occasionally roseate) and yellowish at base, or canary yellow with white tips, or sometimes wholly white, obovate-cuneate, 4 to 7 lines long, a U-shaped band of hairs on the claw; nutlets smooth to strongly tuberculate, about 2 lines in diameter.

Low ground in or near shallow water, forming large patches which color in April the valley levels, 40 to 2000 (or 4500) feet: Coast Ranges from Trinity Co. to San Luis Obispo Co.

Color forms.—In Humboldt Co., says J. P. Tracy, the plant with white corollas is found only in the "Bald Hills" country where it often colors moist spots on the "prairies" in spring; whereas the yellow-flowered form is found only in the coastal region of the southwestern part of the county—Bear River and the Mattole. This geographic color segregation seems to hold in Mendocino Co. and southward to the South Coast Ranges, the yellow form occurring on the coast or in coastal valleys, the white form being montane back of the coast or inhabiting interior valleys, as indicated in the localities below. In Little Rabbit Valley, San Benito Co., an interior locality, we find, however, the yellow form.

Locs.—Coast Ranges: Wimmeshaw, w. Tehama Co., *Jepson* 13,549 (cor. white); Rush Creek, Trinity Co., *Yates* 426; Redwood Creek, n. Humboldt Co., *Jepson* 1941 (cor. white); Kneeland Prairie, *Tracy* 2648; Phillipsville, South Fork Eel River, *Tracy* 5476; Sherwood, Mendocino Co., *Jepson* 2197 (cor. white); Ukiah, *Bolander* 4664; Porter Creek, e. Sonoma Co., *Jepson* 9187; Calistoga, *Jepson* 9175; Capell Valley, *Hilda Gehringer;* Rutherford, Napa Valley, *Jepson;* Sonoma

Valley, *Jepson* 5804; Tomales Pt., *M. S. Baker;* Olema, *Jepson* 4040; Mill Valley, Marin Co., *Jepson* 13,548; West Berkeley, *Jepson* 13,551; Walnut Creek, *Brewer* 1009; Pescadero, *A. L. Grant* 943 (cor. yellow); San Andreas Lake, San Mateo Co., *C. F. Baker* 1916; Halls Valley, Mt. Hamilton, *Jepson* 4213 (cor. white), 8237; Little Rabbit Valley, San Benito Co., *Jepson* 16,132; Santa Margarita, *Jepson* 8441, 11,968.

Refs.—Limnanthes douglasii R. Br. Lond. & Edinb. Phil. Mag. 2:70 (1833), type from Cal., *Douglas;* Lindl. Bot. Reg. t. 1673 (1835); Hook. Bot. Mag. t. 3554 (1837); Jepson, Man. 592 (1925), excluding Sierra Nevada plants. *Floerkea douglasii* Baill. Nat. Hist. Pl. 5:20, fig. 50–54 (1878); Jepson, Fl. W. Mid. Cal. 248 (1901), ed. 2, 244 (1911).

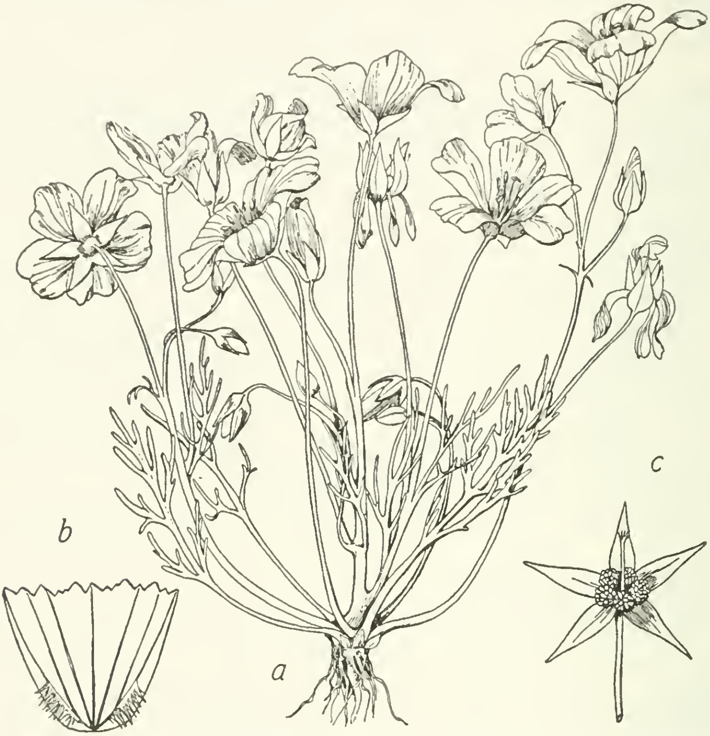

Fig. 216. Limnanthes rosea Hartw. *a*, habit, × 1; *b*, petal base, × 2; *c*, carpels with fruiting calyx, × 1.

2. **L. rosea** Hartw. Valley Foam. (Fig. 216.) Stems more or less fleshy, several from the base, ascending or erect, 4 to 12 inches high; petals broadly to cuneately obovate, retuse or notched at summit, white, the nerves rose-color, commonly aging or fading rosy or with a tinge of rose, sparsely long-hairy inside, 6 to 7 lines long; nutlets grayish or light brown, densely set all over with rather thin spreading scale-like tubercles or crests, the ridges or plates of the tubercles covered with very minute or microscopic roundish granules furnished with microscopic scales.

Moist spots or "hog-wallows" on the valley floors or in the foothills, 40 to 1400 feet: Sacramento Valley; lower San Joaquin Valley. Apr.-May.

Field note.—"In wet places four to five miles from Sacramento, especially in grain fields, it forms large patches, often ten to fifteen feet in diameter. The succulent stems are procumbent. The flowers are very fragrant and much infested by bees."—H. N. Bolander, Apr., 1865.

Locs.—Willows, *Jepson* 13,552; College City, *Ruth Johnson;* Woodland, *L. D. Lawhead;* Sacramento, *Ramaley* 11,027; Sweeney Creek, nw. Solano Co., *Jepson* 8257; Cannon sta., Solano Co., *Jepson* 6783; Waverley, San Joaquin Co., *Sanford;* Mountain Pass, Tuolumne Co., *A. L. Grant* 625; Byron, *Greene.*

Var. **candida** Jepson var. n. Petals pure white, filmy, not aging pink; nutlets irregularly warty but apparently without the characteristic surface markings of the species.—(Petala candida, praetenua, non in aetate rubicundula; nuculae irregulariter verrucosae sed non quam in specie summae notatae.)—Rolling plains, northeast of Madera, 350 to 400 feet, *I. T. Walker* (type); Modesto, *Bessie B. Silverthorn.* Mar.

Field note.—This was collected ten miles northeast of Madera, growing only in adobe vernal pools which undoubtedly hold water for short periods after heavy rains. In such places (only three or four were found) the individuals are growing as thickly as they can stand to the exclusion of practically all other plants, making the little depressions appear at a distance as if filled with purest snow. Unlike other Limnanthi there is no pungent or "cruciferous" taste.—I. T. Walker, Mar. 10, 1925 (Jepson Corr. vol. 35).

Refs.—LIMNANTHES ROSEA Hartw.; Benth. Pl. Hartw. 302 (1848), type loc. "upper Sacramento Valley," *Hartweg* 214 (more specifically near junction of the Yuba and Feather rivers, cf. Erythea 5:54); Jepson, Man. 592, fig. 588 (1925). *Floerkea rosea* Greene, Fl. Fr. 100 (1891). Var. CANDIDA Jepson.

3. **L. alba** Hartw. BALSA FOAM. Stem branching at or above the base, commonly erect, 5 to 8 inches high; young parts and buds more or less pilose, the calyx white-woolly with long hairs; sepals rather broad; petals obovate, truncatish or a little retuse, white, aging rose-pink, at least at apex, 5 to 6 lines long; nutlets reddish-brown, prominently tuberculate, the tubercles composed of plates or strands and thus more or less hollow or lattice-like.

Rolling gravelly or clay plains or hills, open ground, 100 to 3300 feet: western Colusa Co.; east side of the Great Valley from Shasta Co. to Tuolumne Co., and bordering Sierra Nevada foothills. Apr.-May.

Field note.—The plants are usually gregarious in low moist spots in the hills or in grainfields. The corolla tends to become globose in age when the colored withering tips of the petals turn in slightly. The branches are often fleshy-thickened and fragile at the joints.

Locs.—Indian Valley, w. Colusa Co., *Jepson* 16,265; Fall River Valley, *M. S. Baker* 111; Redding, *Blankinship;* Oroville (sw. of), *Dutton;* Lincoln, *Ramaley* 11,108; Slough House, n. Sacramento Co., *Jepson* 15,263; Pacific House, Eldorado Co., *K. Brandegee;* Avery sta., Calaveras Co., *Tracy* 5710; Clements, ne. San Joaquin Co., *Jepson* 15,198, 15,201; Phoenix Lake, Sonora, *A. L. Grant* 46a; Confidence, Tuolumne Co., *A. L. Grant* 764.

Var. **detonsa** Jepson var. n. Calyx glabrous on the outside or nearly so.—(Calyx extus glaber vel subglaber.)—Open valleys or flats, 700 to 4700 feet: Sierra Nevada foothills from Amador Co. to Tuolumne Co. Apr.-June. Very long hairs clothe the inside of the calyx-lobes just as in the species. This is an interesting character, though it sometimes fails in single plants of a collection which otherwise exhibits it (as in *A. L. Grant* 978).

Locs.—Willow Sprs. sta., n. Amador Co. foothills, *Jepson* 15,246; Avery sta., Calaveras Co., *A. L. Grant* (type); Columbia, Tuolumne Co., *A. L. Grant;* Hog Ranch, near Hetch-Hetchy, *A. L. Grant* 978.

Refs.—LIMNANTHES ALBA Hartw.; Benth. Pl. Hartw. 301 (1848), type loc. Sacramento Valley, *Hartweg* 315 (more specifically Butte Co., cf. Erythea 5:54); Jepson, Man. 593 (1925). *L. douglasii* var. *alba* Rattan, Pop. Cal. Fl. 34 (1879). *Floerkea alba* Greene, Fl. Fr. 100 (1891). Var. DETONSA Jepson.

4. **L. striata** Jepson sp. n. FOOTHILL FOAM. Stems several from the base, ascending, 4 to 10 inches high; herbage glabrous; leaves similar to those of L. douglasii; sepals linear-lanceolate, over half as long as the petals; corolla campanulate in outline, white with green-yellow center, the petals obovate-oblanceolate, 4 to 5½ lines long, longitudinally marked with 7 brown-purple lines which extend from the base nearly to the apex, not aging rose or pink; petal-claws with 2 rows of vertical hairs which subtend the filament of the opposite stamen; nutlets red-brown, smoothish except at the summit which is sparsely set with whitish short-ovate or triangular acute scales.—(Caules ex basi plures, ascendentes, unc. 4–10 alti; herbae glabrae; sepala lineari-lanceolata, petalis breviora; corolla campanulata, alba, centro flavo-viridis; petala obovato-oblanceolata, 7-striata, lin. 4–5½ longa; striae brunneo-purpureae non in aetate roseae vel puniceae; carpella fusca, laeviuscula, ad apicem laminis albidis breviter ovatis vel deltoideis acutis rarus operta.)

Open moist ground in the foothills, 650 to 1000 feet: Amador Co. to Tuolumne Co. Apr.

Locs.—Willow Sprs. sta., n. Amador Co., *Jepson* 15,247 (type); Burson, Calaveras Co., *Jepson* 9951a; east of Knights Ferry, *David Goddard.*

5. **L. montana** Jepson sp. n. Mountain Foam. Stems slender or almost filiform, 1 or several from the base, branching only above, 4 to 9 inches high; herbage glabrous; calyces glabrous or sometimes slightly hairy; sepals ovate-lanceolate, acuminate; petals white, apparently not aging pink, subspatulate, that is, obtusely obovate at summit and contracted below into a long broad claw, 3 to 4½ lines long, ¾ to 1¾ lines wide; nutlets long-obovoid, acutely warty at summit.—(Caules graciles vel subfiliformes, unc. 4–9 alti; herbae glabrae; calyces glabri vel nunc leviter pubescentes; sepala ovato-lanceolata, acuminata; petala alba, species non in aetate rubicundula, subspatulata, lin. 3–4½ longa, ¾–1¾ lata; nuculae longo-obovoideae, acute summae verrucosae.)

Springy situations, 2000 to 5500 feet: southern Sierra Nevada in Tulare Co. Mar.-May.

Locs.—Oriole Lake, on headwaters of a branch of Squirrel Creek, *W. Fry* 346 (type); Middle Fork Tule River, *Peirson* 5629.

6. **L. versicolor** Rydb. Shasta Foam. Stems 1 or few from the base, firmly erect, 5 to 13 inches high; herbage glabrous; leaves mostly basal; leaflets oblong or linear, entire or 3-divided, 1 to 5 lines long; flowers somewhat corymbose, on pedicels ½ to 2¼ inches long; sepals ovately lanceolate, acuminate, ⅔ to nearly as long as the petals; petals "cream-color, changing to lilac-purple at the tips", narrow (1¼ to 2 lines wide), 4 to 5 lines long; nutlets smoothish or a little wrinkled, destitute of distinct tubercles.

Along streams, 1000 to 2000 feet: Shasta Co. May-July.

Locs.—Morley sta., *Baker & Nutting;* Tamarack road at Stalkers, *M. S. Baker* 359.

Var. **parishii** Jepson var. n. Plant diffuse; calyces disposed to be somewhat rotate, the sepals less acuminate than in the species; nutlets wrinkled, the ridges bearing fine granules.—(Plantae diffusae; calyces subrotati, sepalis quam in specie minus acuminatis; nuculae rugatae, liris minute granosis.)—Stonewall Mine, Cuyamaca Mts., *Parish* 4416 (type).

Refs.—LIMNANTHES VERSICOLOR Rydb. N. Am. Fl. 25:99 (1910). *Floerkea versicolor* Greene, Erythea 3:62 (1895), type loc. Cedar Run, Shasta Co., *Baker & Nutting.* Var. PARISHII Jepson.

2. FLOERKEA Willd.

Similar to Limnanthes but the flowers 3-merous. Petals small, entire, shorter than the sepals, alternate with as many glands. Stamens 6. Stigmas 3, not capitate.—Species 1, North America. (H. G. Floerke, 1764–1835, a German botanist.)

1. **F. proserpinacoides** Willd. Stems slender, (1½ or) 6 to 12 inches high; herbage glabrous; petals white, 1 line long; nutlets with somewhat slender tubercles at summit.

Mountain valleys, 5000 to 7500 feet: northern Sierra Nevada from Placer Co. to Modoc Co. North to Washington, east to Delaware. June.

Locs.—Truckee River, Placer Co., *Sonne* 344; Cisco, *H. A. Walker* 1314; Long Lake, Plumas Co.; Squaw Valley, Nevada Co. (Zoe 4:151); Soupan Sprs., Lassen Peak; Susanville, *T. Brandegee;* Big Valley Mts., *Baker & Nutting.*

Refs.—FLOERKEA PROSERPINACOIDES Willd. Neue Schr. Ges. Nat. Fr. Berl. 3:449 (1801) type from Pennsylvania; Jepson, Man. 593 (1925).

POLYGALACEAE. Polygala Family

Perennial herbs or bushes with alternate simple leaves and no stipules. Flowers irregular and resembling the papilionaceous flowers of Leguminosae, but not like them in structure, borne in terminal racemes. Stamens (in ours) monadelphous. Ovary simple, superior.—Genera 8, species 780, widely distributed over nearly the entire earth.

Bibliog.—Bennett, A. W., Polygalae Americanae novae vel parum cognitae (Jour. Bot. 17: 137–143, 168–173, 201–207,—1879). Wheelock, W. E., The genus Polygala in North America (Mem. Torr. Club 2:109–152,—1891). Chodat, R., Sur la distribution et l'origine de l'espèce et des groupes chez les Polygalacées (Arch. Sci. Phys. Nat. Genève 3me pér. 25:695–714,—1891); Monographia Polygalacearum, i (Mem. Soc. Phys. Hist. Nat. Genève 1890 supplem.⁷:1–143, t. 1–12,—1891), ii (l.c. 31²:1–500, t. 13–35,—1893). Blake, S. F., Revision of the genus Polygala in Mex., Cent. Am. and West Indies (Contrib. Gray Herb. 47:1–122, pls. 1–2,—1916).

1. POLYGALA L. Milkwort

Stems often with milky juice. Sepals 5, thin, the two lower and the upper concave one of about the same size, the two lateral much larger, colored, and projecting like the wings of a pea-flower. Petals 3, united at base, 2 forming a posterior pair, the third anterior and called the "keel," hooded above and often beaked or crested, enclosing the stamens and style. Stamens 8, monadelphous, the tube open on one side and adnate to the base of the petals. Ovary 2-celled with one ovule in each cell; style long, curved. Capsule with thin walls, flattened contrary to the partition, rounded and often notched above, dehiscing loculicidally at the margin. Seeds with a conspicuous caruncle.—Species about 400, all continents. (Polus, much, and gala, milk, an ancient Greek name for some shrub used as a stimulant.)

Spineless plants; flowers in distinct racemes; cismontane.
  Beak of the keel broad, strongly curved; flowers purple; sepals glabrous or essentially so; caruncle often wrinkled and bladdery, its lobes concealing the upper part of the seed like a cap; herbaceous; Coast Ranges............1. *P. californica.*
  Beak of the keel slender, straight or nearly so; flowers greenish-white; sepals pubescent; caruncle almost as long as the seed, not cap-like, but with a short lobe projecting downward a little on each side of the seed; woody at base; Sierra Nevada mostly...... 2. *P. cornuta.*
Spiny plants; flowers in reduced racemes, often appearing solitary and axillary or subaxillary; desert region.
  Herb; leaves sessile; herbage green; flowers mostly pink............3. *P. subspinosa.*
  Shrub; leaves short-petioled; herbage ashy-pubescent; flowers mostly whitish............ 4. *P. acanthoclada.*

1. **P. californica** Nutt. Coast Polygala. Stems many from the crown of a perennial root, mostly simple, 3 to 8 inches high; leaf-blades oblong- or elliptic-ovate, ½ to 1½ inches long, distinctly petioled; flowers of two sorts: those near the root apetalous and developing most of the fruit; those of the terminal racemes with rose-purple corollas 5 to 6 lines long; capsules broadly elliptical, 3 lines long.

Wooded or brush-covered slopes, 50 to 3000 feet: coastal region from San Luis Obispo Co. to Marin Co., the Napa Range and Trinity Co. North to Oregon. Not reported from the inner Coast Range. May-June.

Locs.—Rush Creek, Trinity Co., *H. S. Yates* 440; Hupa, *Chandler* 1328; Bull Creek, Humboldt Co., *Jepson* 16,459; Cahto, *Jepson;* Ft. Bragg, *W. C. Mathews* 38, 185; Red Mt., se. Mendocino Co., *Jepson* 3032; Elk Mt., n. Lake Co., *Tracy* 2332; Mt. St. Helena, *E. Ferguson* 353; Howell Mt., *K. Brandegee;* Sonoma Cañon near Hood's Peak, *Jepson* 10,011; Monte Rio, Russian River, *E. Ferguson* 236; Bodega, *Vina W. Krager;* Mt. Tamalpais, *Jepson* 13,573; Saratoga, Santa Cruz Mts., *Jepson* 5160; Pacific Grove, *Heller* 6779; San Carpoforo, San Luis Obispo Co., *Condit.*

Refs.—Polygala californica Nutt.; T. & G. Fl. 1:671 (1840), type from coastal Cal., *Nuttall;* Jepson, Fl. W. Mid. Cal. 249 (1901), ed. 2, 244 (1911), Man. 593, fig. 589 (1925). *P. cucullata* Benth. Pl. Hartw. 299 (1849), type loc. in woods at Monterey, *Hartweg* 7. *P. nutkana* Torr. Bot. Mex. Bound. 49, pl. 12 (1859), not Moc. (1824).

2. **P. cornuta** Kell. Sierra Polygala. Stems several from the base, branching, woody below, 1 to 3 feet high; leaf-blades ovate to oblong or linear, ¾ to 1¼ (or 1¾) inches long, shortly petioled; flowers greenish-white, 4 lines long, borne in a short dense terminal raceme; outer sepals densely puberulent; lateral petals scarcely equaling the keel; capsules orbicular.

Rocky or gravelly slopes in the mountains, 1500 to 3500 feet: Sierra Nevada from Fresno Co. to Siskiyou Co., thence south in the Coast Ranges to Lake Co. June-July.

Locs.—Sierra Nevada: Tehipite Valley; Yankee Hill, Columbia, *A. L. Grant* 11; Gold Dollar Mine trail to Pine Nut, Foresthill divide, Placer Co., *L. S. Smith* 1705; Blue Cañon, Placer Co., *K. Brandegee;* Whitmore, Shasta Co., *Alma A. Weigart;* upper Fall River Valley, *Jepson* 5781. Coast Ranges: Sisson, *Jepson* 13,574; Shasta Sprs., *Jepson* 13,575; Hoboken trail from Nobles Ranch, New River, *Jepson* 1985; Willow Creek, Trinity River, *Tracy* 3447; Snow Mt., n. Lake Co. (Zoe 4:171).

Var. fishiae Jepson. Bush 2 to 4 feet high, often growing up through brush and reclining on it; outer sepals puberulent; inner (large) sepals glabrous or sometimes puberulent; wings purple; keel yellow.—Rocky slopes in the foothills and mountains, 1500 to 3000 feet: Southern California from Santa Barbara Co. to San Diego Co. South to Lower California. The flower in structure and details of pubescence is remarkably like that of P. cornuta. The undulate auricles on inner angles of hood may be present in both forms—the variety and the species. In the variety the large sepals are usually subglabrous but may be puberulent. Notching of the lateral sepals at apex is not a constant character in either form.

Locs.—Carpinteria (cañon back of), *Van Dyke;* Matilija Cañon, Ojai Valley, *Peckham;* Crater Camp, Santa Monica Mts. (Bull. S. Cal. Acad. 19:54); Mt. Wilson (Erythea 2:84); Temecula Cañon, *Munz* 7127; Dulzura, San Diego Co., *Hagenbock.*

Refs.—POLYGALA CORNUTA Kell. Proc. Cal. Acad. 1:62 (1855), type loc. Placerville; Jepson, Man. 594 (1925). Var. FISHIAE Jepson, Man. 594 (1925). *P. fishiae* Parry, Proc. Davenp. Acad. 4:39 (1884), type loc. Sauzal, Todos Santos Bay, L. Cal., *Fanny E. Fish.*

3. **P. subspinosa** Wats. SPINY POLYGALA. Stems several, slender, erect, arising from a much-branched underground root-crown, thus forming a low tuft 2 to 6 inches high; taproot often very woody, 2 to 8 lines in diameter; branchlets wholly spinose, straight, leafless, 5 to 7 lines long; leaf-blades ovate, acute, microscopically puberulent, sessile, 3 to 7 lines long; flowers solitary and axillary, 4 to 5 lines long, with membranous bracts, on colored pedicels 3 to 4 lines long; pedicels reflexed in age; sepals pink; petals linear, pinkish- and yellowish-marked, truncatish and erosulate at the dark purple tips; keel whitish and pinkish, with a broad yellow beak as long as or longer than the sac; capsules suborbicular, short-stipitate, veiny, 3 lines long

Rocky soil, 5 to 6500 feet: southeastern Inyo Co. East to western Colorado and northern Arizona. May-June.

Locs.—Chloride Cliffs, Death Valley, *Dix Van Dyke.* Nev.: Pioche, *Maud Minthorn;* Juniper Mts., *Purpus* 6240.

Refs.—POLYGALA SUBSPINOSA Wats. Am. Nat. 7:299 (1873), type loc. Kanab, s. Utah, *Ellen P. Thompson.*

4. **P. acanthoclada** Gray. DESERT POLYGALA. Spiny shrub ½ to 2½ feet high; herbage ashy-pubescent; leaf-blades oblanceolate to linear, 3 to 6 lines long, on very short but distinct callus-like petioles; flowers yellowish-white, 2 lines long; petals purplish-tinged at apex, very shortly and very unequally 2-lobed at apex; capsules broadly elliptic, emarginate, 2½ lines long.

Desert mesas, 2500 to 3500 feet: Cottonwood Mts., north side of the Colorado Desert; eastern Mohave Desert in the Shadow Mts. and New York Mts. East to Arizona and Colorado. July.

Habit note.—Divaricately, numerously and shortly branched, this species as it occurs in the eastern Mohave Desert forms low circular mounds 1 to 5½ feet broad and 6 to 14 inches high which probably present a denser weave in the plant body than is found in any other woody species in California. It grows near Barnwell; it has also been collected at the Yucca Grove road sta., east of Halloran Spr., Shadow Mts. (*Jepson* 15,805); and it is reported from Cottonwood Spr. (*Peirson*).

Refs.—POLYGALA ACANTHOCLADA Gray, Proc. Am. Acad. 11:73 (1876), type loc. San Juan River, se. Utah, *T. Brandegee;* Jepson, Man. 594 (1925).

EUPHORBIACEAE. SPURGE FAMILY

Herbs or shrubs, often with milky juice. Leaves simple. Flowers monoecious or dioecious, in ours small or minute (1½ to 2 lines long), always apetalous in ours (except Argythamnia), often naked, that is, destitute of calyx as well, sometimes exceedingly reduced and enclosed in a calyx-like involucre. Stamens 1 to many.

Ovary superior, 3 (4 or 1)-celled, with one or two pendulous ovules in each cell. Styles or stigmas as many or twice as many as the cells of the ovary. Capsule commonly 3-lobed, 3-valved. Embryo straight, the flat cotyledons almost as wide as the fleshy or oily endosperm.—Genera about 220, species about 4500, all continents, chiefly tropical.

Bibliog.—Scheele, A., Beiträge zur Kenntnis der Euphorbiaceae (Linnaea 25:580–588,—1825). Baillon, M. H., Étude générale du groupe des Euphorbiacées, 1–684,—1858. Bentham, Geo., Notes on Euphorbiaceae (Jour. Linn. Bot. Soc. 17:185–267,—1878). Parry, C. C., New genus of Euphorbiaceae (West Am. Sci. 1:13–14,—1885). Engelmann, Geo., Papers on Euphorbiaceae (Botanical Works, 433–449,—1887). Ferguson, A. M., Crotons of the United States (Rep. Mo. Bot. Gard. 12:33–73, pls. 4–31,—1901). Pax, F. and Hoffmann, K., Euphorbiaceae-Hippomaneae (Engler, Pflzr. 4^{147-5}:1–319, figs. 1–58,—1912); Acalypheae-Chrozophorinae 4^{147-6}: 1–142, figs. 1–25,—1912); Acalypheae-Mercurialinae (4^{147-7}:1–473, figs. 1–67,—1914); Acalypheae-Plunkenetiinae (4^{147-9}:1–108, figs. 1–24,—1919); Acalypheae-Ricininae (4^{147-11}:112–134, figs. 26–29,—1919); Crotonoideae-Acalypheae-Acalyphinae (4^{147-16}:1–178, figs. 1–3,—1924). Johnston, I. M., [Notes on Securinega and Tetracoccus] (Univ. Cal. Publ. Bot. 7:441–442,—1922). Haber, J. M., Anatomy and morphology of the flower of Euphorbia (Ann. Bot. 39:657–707, figs. 1–112,—1925). Anon., Turkey Mullein in hay (Mo. Bull. Cal. Dept. Agr. 19:50,—1930).

Staminate flowers with a calyx, the pistillate with or without a calyx, neither kind borne in an involucre.
Ovary with 2 ovules in each cell; anthers erect in the bud; flowers pediceled, disposed in umbellate axillary clusters; shrubs.
Leaves alternate; capsule 3-celled........1. SECURINEGA.
Leaves opposite; capsule 4-celled........2. TETRACOCCUS.
Ovary with 1 ovule in each cell; shrubs or herbs.
Leaves alternate.
Anthers in the bud bent inward and downward.
Ovary 1-celled; annual........3. EREMOCARPUS.
Ovary 3-celled; perennial herbs or sometimes woody at base........4. CROTON.
Anthers erect in the bud.
Corolla present; flowers in much reduced axillary spikes or clusters; herbage mostly grayish or silvery; herbs........5. ARGYTHAMNIA.
Corolla none; flowers in distinct spikes or racemes.
Herbage pubescent or canescent; leaves crenate or serrate, with stipules; shrubs.
Style very short or none; stigmas 3; leaves silvery-canescent beneath.. 6. BERNARDIA.
Styles 3, filiform-dissected; leaves green-puberulent........7. ACALYPHA.
Herbage glabrous; stipules none.
Leaves peltate; stamens many; styles 3, united at base; shrub........ 8. RICINUS.
Leaves not peltate; stamens 2 to 6; styles 3; herbs.
Stamens 2; styles distinct; herbage glabrous........9. STILLINGIA.
Stamens 3 or more; styles (in ours) united below; herbage (in ours) hispid........10. TRAGIA.
Leaves opposite; flowers mostly dioecious; styles 2; annual........11. MERCURIALIS.
Flowers all without calyx, borne however in a calyx-like involucre which simulates a single flower; leaves alternate or opposite........12. EUPHORBIA.

1. **SECURINEGA** Comm.

Shrubs, ours with entire obovate small leaves. Flowers dioecious. Calyx imbricated, bearing an entire or irregularly 5-lobed disk. Staminate flower: sepals 5 or 6, distinct; stamens in ours 3 to 7; rudiment of pistil absent or present, often 2 or 3-cleft. Pistillate flower: ovary 3 or 4-celled, each cell 2-ovuled; styles 3 or 4, simple, united at base, stigmatic down the inside. Seeds in ours with a caruncle.—Species 10, all continents. (From Latin securis, an axe, in reference to the hardness of the wood.)

1. **S. fasciculata** Jtn. var. **hallii** Jepson. Intricately branched shrub 2 to 6 feet high, with rigid branches and spinescent branchlets; herbage subglabrous; leaves in fascicles, their blades obovate, 2 to 3 lines long; sepals 6, minute; capsules globose, minutely and thinly pubescent, 3 lines long.

Dry mesas, rocky slopes or sandy washes, 100 to 2500 feet: mountains on north side of Colorado Desert. Apr.-May.

Locs.—Cottonwood Spr., Cottonwood Mts., Riverside Co., *Jepson* 12,558; Eagle Mts., *Clary;* Corn Sprs., Chuckwalla Mts., *Munz & Keck* 4882; Beal Well, Chocolate Mts., *Jaeger.*

Field note.—On the dry hills about Cottonwood Spring northeast of Mecca, this shrub, for several miles in various directions, is everywhere common. In aspect it is distinguishable from all the other associated shrubs by its singular skeleton-like habit combined with its angular branching. It does not, like certain desert shrubs, produce a multitude of branches or branchlets but only relatively few. The almost right-angle divarication of branches, or indeed frequently right-angle divarication, is of such a nature that the arms of a dichotomy will cross and make a rectangle. The leaf-rosettes and flower-clusters are produced on very short spurs on old wood, so that the shrub almost from the ground, is clothed with the leaf-rosettes, thus accenting markedly the distinctiveness of its appearance.

Refs.—SECURINEGA FASCICULATA Jtn. Univ. Cal. Publ. Bot. 7:441 (1922). *Bernardia fasciculata* Wats. Proc. Am. Acad. 18:153 (1883), type loc. Monclova, Coahuila, n. Mex., *Palmer* 1233. *Halliophytum fasciculatum* Jtn. Contrib. Gray Herb. 68:88 (1923). Var. HALLII Jepson, Man. 595 (1925). *Tetracoccus hallii* Bdg. Zoe 5:229 (1906), type loc. Chuckwalla Bench between Cañon Sprs. and Chuckwalla Spr., *Hall* 5865. *S. hallii* Jtn. Univ. Cal. Publ. Bot. 7:442.

2. TETRACOCCUS Engelm.

Shrubs with entire linear leaves. Flowers reddish, small, dioecious. Staminate flowers in umbellate clusters of 1 to 5 on axillary pedicels shorter than the leaves; calyx 6 to 10-parted, with about 6 to 8 stamens surrounding a circle of reniform disk-glands at their base. Pistillate flower solitary, pediceled; calyx similar to the staminate; ovary 4-celled, the cells with 2 ovules; styles 4, simple, distinct. Capsule 4-celled and 4-lobed, the valves separating from a stout 4-angled columella; seed usually solitary, strophiolate.—Species 1. (Greek tetra, 4, and kokkos, fruit, referring to the 4-lobed capsule.)

1. **T. dioicus** Parry. Two to 5 feet high, the branches rather slender; leaves opposite or some alternate, the blades ½ to 1¼ inches long, very shortly petioled; staminate flower-clusters 3 to 5 lines long; staminate calyx ½ line long, the stamens much exserted and a little woolly at base.

Dry hills, 800 to 2000 feet: western San Diego Co. South to Lower California. Mar.

Locs.—Betw. Temecula and Pala, *Orcutt;* Rainbow, *Parish* 9130; Jamacha, *Alice A. Murphy.*

Refs.—TETRACOCCUS DIOICUS Parry, West Am. Sci. 1:13, 35 (1885), type from L. Cal. (Table Mt., *Parry;* Santo Tomas, *Orcutt*); Jepson, Man. 595 (1925). *T. engelmannii* Wats. Proc. Am. Acad. 20:373 (1885), based on Parry's Table Mt. spm. (not "St. Thomas") and Orcutt's St. Thomas, both from L. Cal.

3. EREMOCARPUS Benth.

A low gray annual with entire 3-nerved leaves. Staminate flowers pediceled in terminal corymbs; calyx 5 or 6-parted; stamens 6 or 7 on a hairy receptacle; filaments exserted. Pistillate flowers 1 to 3 in the lower axils, without calyx; ovary 1-celled, with 4 or 5 small glands at the base; style undivided, stigmatic at apex; capsule 2-valved, 1-seeded.—Species 1. (Greek eremos, solitary, and karpos, fruit.)

1. **E. setigerus** Benth. TURKEY MULLEIN. Stems dichotomously branched, forming a prostrate mat 1 to 3 feet wide or a low broad plant 5 to 8 inches high, or reduced to a dwarf 1 to 2 inches high; herbage stellate-pubescent and rough-hispid (especially below) with stinging hairs; leaves alternate or the upper opposite, the blades thick, ovate, the smaller varying to almost orbicular, ⅓ to 2½ inches long, the petioles nearly as long or longer; ovary and style densely pubescent; capsules 2 lines long; seeds smooth and shining, 1½ lines long.

Dry open low hills, plains and valleys, chiefly in gravelly or sterile clay soils, 10 to 2500 feet or sometimes to 5200 feet: throughout cismontane California, especially abundant towards the interior. North to Washington, east to Nevada. May-Oct.

Geog. note.—Throughout cismontane California at low altitudes Eremocarpus setigerus is one of the most common and widely distributed plants of the dry open plains and foothills during the rainless season. On the undulating plain on the east side of the Great Valley, between the alluvial floor and the first foothills, it is more common, during the dry period, than any other species. For hundreds of miles these tiny plants, ½ to 1 or 2 inches high, forming a rosette of leaves on the ground with a small central cluster of flowers, dot the rolling gravelly plain and often, in July, represent over extensive areas almost the only living vegetation. Or again in looser or richer soil the plants enlarge in size to low mounds a few inches high or ½ to 1½ feet across. Wherever there is summer fallow cultivation of the soil the Turkey Mullein becomes an impressive plant, flourishes extremely and adapts itself well to broken ground. Undoubtedly its natural range has been much extended by sheep, whence the folk name Sheep Weed. It is thought to have been thus introduced forty years or more ago into the Cantua Creek country in the inner Coast Range of western Fresno Co. and it reappears sporadically in the northern Sierra Nevada in such a manner as to suggest introduction, as on the Walker plain in Butte Co., at 5200 feet, and in the Willow Creek country near Susanville.

The California Indians used the heavy-scented herbage of this plant to stupefy fish in small streams in order that they might be caught by hand, whence the Spanish-Californian name, Yerba del Pescado. The seeds form an important resource for foraging turkeys and are also eaten by mourning-doves. The Turkey Mullein is also known to the folk as Stickweed and Flannel Weed.

Locs.—S. Cal.: San Diego, *Mary F. Spencer* 51; Riverside, *Jepson;* Santa Ana Cañon, Orange Co., *J. T. Howell* 3108; San Bernardino, *Parish;* Chula Vista; Los Angeles, *E. D. Palmer.* Tehachapi Mts.: Tehachapi Valley, *Jepson* 7430. Coast Ranges: San Luis Obispo, *Condit;* Arroyo Seco, Santa Lucia Mts., *Jepson;* New Idria, *Brewer* 778; Llanda, San Benito Co., *Jepson* 12,413; upper Lagunitas Creek, Marin Co., *Jepson* 9496; St. Helena, *Jepson* 9839; Ukiah, *Jepson* 7630; Ft. Bragg, *W. C. Mathews;* Hupa, *Manning;* Weaverville, *Yates* 557; betw. Castle Rock sta. and Dunsmuir, *Jepson;* Yreka, *Butler* 69. Great Valley: Bakersfield, *Davy* 2399; Antelope plain, nw. Kern Co., *Jepson;* Little Table Mt. (3 mi. w.), Madera Co., *Jepson* 12,945; Oakdale, *Jepson* 7717; Stockton, *H. P. Fitch;* Antioch, *Jepson;* Cordelia, *Jepson* 3082; Vacaville, *Jepson* 8421, 13,910; Lincoln, Placer Co., *Jepson* 10,601; Princeton, Colusa Co., *Davy;* Hamilton, Glenn Co., *Heller* 11,753; Coram, Shasta Co., *Blankinship.* Sierra Nevada foothills: North Fork Kaweah River, *Jepson;* Friant, Fresno Co., *Jepson;* Hetch-Hetchy, *Jepson;* Gwin Mine, Calaveras Co., *Jepson;* Manton, Tehama Co., *Jepson* 15,332. Modoc Co.: Alturas, *Jepson.*

Refs.—EREMOCARPUS SETIGERUS Benth. Bot. Sulph. 53, t. 26 (1844); Jepson, Fl. W. Mid. Cal. 260 (1901), ed. 2, 245 (1911), Man. 595, fig. 590 (1925). *Croton setigerus* Hook. Fl. Bor. Am. 2:141 (1838), "Menzies Isl. and sandy banks of the Columbia River", *Douglas. Piscaria setigera* Piper, Contrib. U. S. Nat. Herb. 11:382 (1906).

4. **CROTON** L.

Ours perennial herbs, the stems often woody at base. Leaves entire. Flowers monoecious, sometimes dioecious. Staminate flowers in racemes; calyx 5-divided; glands of the disk as many as and alternate with the petals; stamens 5 to many. Pistillate flowers mostly solitary; calyx 5-parted; ovary 3-celled, the cells 1-ovuled; styles twice forked or 4-cleft into broadly linear lobes. Capsule 3-lobed, globose in outline. Seeds smooth and shining, with a caruncle.—Species about 600, mostly tropical, a few subtropical, all continents except Europe. (Kroton, a tick, the Greek name of the Castor Plant, its seeds resembling that insect.)

1. **C. californicus** Muell. Arg. Stems branching, erect or diffuse, 1 to 3 feet long; herbage hoary or the leaves green above; leaf-blades oblong to elliptic, ¾ to 3 inches long, on petioles 3 to 8 lines long; staminate racemes at length 6 to 7 lines long, developing gradually, the flowers soon deciduous after anthesis and leaving an elongated naked rachis; staminate calyx about 1 line long; stamens 7 to 14, with hairy filaments; pistillate flowers on short pedicels; styles flabelliform, each cleft into 4 linear segments, the segments entire or cleft or toothed at apex; capsules scurfy, 3 to 4 lines broad.

Sandy hills along the coast line, washes and sandy mesas in the interior, 5 to 2200 feet: Antioch region, Contra Costa Co.; San Francisco to coastal Southern California, thence east to the interior deserts. Mar.-Oct.

Econ. note.—Mexicans near Redlands say of this plant, "esa ha de ser la que llamamos la yerba del pescado" and explain that it is used for the same purpose as Eremocarpus setigerus, namely as a means of catching fish in small streams (Harry Steele Budd in Jepson Corr. 3:297 ms). The mourning dove feeds on the seeds.

Locs.—Antioch, *Jepson* 10,211; Mountain Lake, San Francisco, *Jepson* 5c; Monterey, *Jepson* 9765; Bicknell sta., n. Santa Barbara Co., *Jepson* 12,681; Barstow, *Jepson* 4804; Warrens Well, n. Riverside Co., *J. T. Howell* 2898; Riverside, *Jepson* 1217; San Bernardino, *Parish;* Colton, *Blankinship;* Pacoima Cañon, San Gabriel Mts., *Peirson* 276; Manhattan Beach, near Redondo, *Julia A. Bettys;* Anaheim plain, *Alice King;* Palm Cañon of San Jacinto, below Vandeventer ranch, *Jepson* 1404; Palomar Mt., *Esther Hewlett* 47; La Jolla, w. San Diego Co., *Newlon* 308.

The following varietal segregations, named over thirty years since, do not well cover the many forms known today: Var. MAJOR Wats. Stouter and with large leaf-blades 1½ to 3 inches long; staminate racemes denser, with larger flowers; pistillate flowers more numerous.—Santa Barbara Co. to San Diego Co.; Oceanside, *Parish* 4448. Var. TENUIS Ferg. Stems more slender; leaf-blades narrowly oblong to lanceolate, ½ to 1 inch long, on short petioles 1 to 4 lines long; flowers dioecious; caruncle prominent, with a broad appressed lobed base.—Potrero, San Diego Co.; Borrego Valley, ne. San Diego Co., *Jepson* 8817, 8818; Ft. Mohave, Ariz. Var. LONGIPES Ferg. Stems much branched; leaf-blades oval, 5 to 10 lines long, only slightly pubescent above.—Utah and west to Southern California acc. *Ferguson* (Mo. Bot. Gard. Rep. 12:65). Var. MOHAVENSIS Ferg. Much branched, 1½ to 2¼ feet high; leaf-blades narrowly oblong, 3 to 10 lines long.—Mohave Desert (Barstow, *Jepson* 5188); upper San Joaquin Valley.

Refs.—CROTON CALIFORNICUS Muell. Arg.; DC. Prod. 15^2:691 (1866); Abrams, Fl. Los Ang. ed. 2, 212 (1917); Jepson, Fl. W. Mid. Cal. 261 (1901), ed. 2, 245 (1911), Man. 596, fig. 591 (1925). *Hendecandra procumbens* Esch. Mem. Acad. Petersb. 10:287 (1826), type loc. San Francisco, *Chamisso;* not Croton procumbens Jacq. (1769). Var. MAJOR Wats. Bot. Cal. 2:69 (1880), type loc. Santa Barbara, *Nuttall;* Jepson, l.c. Var. TENUIS Ferg. Rep. Mo. Bot. Gard. 12:64, pl. 27, fig. 1 (1901); Jepson, l.c. *C. tenuis* Wats. Proc. Am. Acad. 14:297 (1879), type loc. Potrero, San Diego Co., *Cleveland.* Var. LONGIPES Ferg. l.c. 65, pl. 27, figs. 2–3; Jepson, l.c. *C. longipes* Jones, Proc. Cal. Acad. Sci. ser. 2, 5:721 (1895), type loc. near Leeds, Utah, *Jones* 5213. Var. MOHAVENSIS Ferg. l.c. 65, type loc. Soda Lake, Mohave Desert, *Cooper;* Jepson, l.c.

5. **ARGYTHAMNIA** Swartz

Herbs or herb-like, ours perennial, the stems often woody below. Flowers usually monoecious, in very short or reduced axillary spikes or clusters consisting of about 2 to 5 flowers. Sepals 5, nearly distinct, hairy. Petals 5, straw-color, alternate with the calyx-lobes and with the lobes of the glandular disk. Glands 5, set between the petal-claws. Stamens (in ours) 10 to 15, the filaments united into a central column, disposed in sets of 5, the third or upper whorl sterile. Anthers erect in the bud. Styles 3, once to thrice forked. Seeds shallowly pitted or reticulate.—Species 45, tropical and subtropical North and South America and south to Chile. (Greek arguros, silver, and thammos, bush, the species often hoary.)

Herbage pubescent to strigose; capsule hairy.
  Plants without glands (rarely present in young leaves); stipules non-glandular, bract-like and dry or forming a hairy tuft.
    Sepals wholly green; branches loosely spreading from the root-crown, fragile, sparsely leafy; upper leaves linear or narrowly lanceolate, sericeous....1. *A. sericophylla.*
    Sepals green with white-scarious margins; branches closely clustered on the root-crown, not markedly brittle, leafy; upper leaves lanceolate to ovate, long-strigose........ 2. *A. serrata.*
  Plants with glands, the teeth or marginal bristles of the leaves, sepals (of the pistillate flowers) and bracts tipped with glands; stipules green with gland-tipped teeth........ 3. *A. clariana.*
Herbage light green, glabrous; capsule glabrous........4. *A. californica.*

1. **A. sericophylla** Gray. (Fig. 217.) Stems slender, much-branched at the nodes and inextricably interlaced, very brittle, somewhat woody below, 8 to 18 inches high; herbage silvery-strigose; leaf-blades lanceolate to linear or oblong, acute, ½ to 1¼ inches long; sepals ovate to lanceolate; sterile whorl of stamens stellate, that is, reduced to 5 very short lobes stellately arranged, or obsolete; petals white, deltoid to lance-ovate, abruptly short-clawed, hairy on the back; seeds gray with shallow circular pits and stellate markings.

Rocky cañons or sandy flats, 500 to 2000 feet: mountains on north and west sides of the Colorado Desert. East to Arizona, south to Lower California. Apr.-May.

Locs.—Santa Maria Mts., e. Riverside Co., *Schellenger* 9; Painted Cañon, n. of Mecca, *Jepson* 11,669; Palm Sprs., Mt. San Jacinto, *Parish* 4141; Palm Cañon of San Jacinto, below Vandeventer ranch, *Jepson* 1400; Palm Cañon of Mt. San Isidro, *Jepson* 8800.

Refs.—ARGYTHAMNIA SERICOPHYLLA Gray; Wats. Bot. Cal. 2:70 (1880), type loc. Verdi River, Ariz., *Smart;* Jepson, Man. 597 (1925). *Ditaxis sericophylla* Hel. Cat. N. Am. Pl. ed. 1, 5 (1898).

2. **A. serrata** Muell. Arg. (Fig. 218.) Stems several, 2 or 4 to 12 inches long; herbage strigose; leaf-blades broadly ovate to obovate or lanceolate, obscurely serrulate or entire, ½ to 1 inch long, contracted to a more or less distinct petiole; sterile whorl of stamens consisting of 5 filaments; petals thin, whitish, purple-veined, narrow-ovate, acute or acuminate, often serrulate, gradually narrowed at base but not definitely clawed, glabrous or merely ciliate at apex; seeds gray, discoid-reticulate, the disks stellately lineate.

Gravelly washes, 50 to 2500 feet: Colorado Desert; eastern Mohave Desert. Southern Nevada and Arizona to Lower California. July-Nov.

Locs.—Ft. Yuma (Bot. Cal. 2:69); Milpitas, Colorado River, *Jepson* 5285; Yaqui Well, e. San Diego Co., *Jepson* 12,520; Hexie Mt., n. side Colorado Desert, *Clary* 928; Pinto Basin, s. Mohave Desert, *Jepson* 12,630; Ash Hill, Mohave Desert, *Hall* 6091. Searchlight, Nev., *Parish* 10,265.

Refs.—ARGYTHAMNIA SERRATA Muell. Arg. Linnaea 34:147 (1865); Jepson, Man. 597 (1925). *Aphora serrata* Torr. Bot. Mex. Bound. 197 (1859), based on spms. from Ft. Yuma, Cal., *Schott*, and Gila River, Ariz., *Parry*. *Ditaxis serrata* Hel. Cat. N. Am. Pl. ed. 1, 5 (1898).

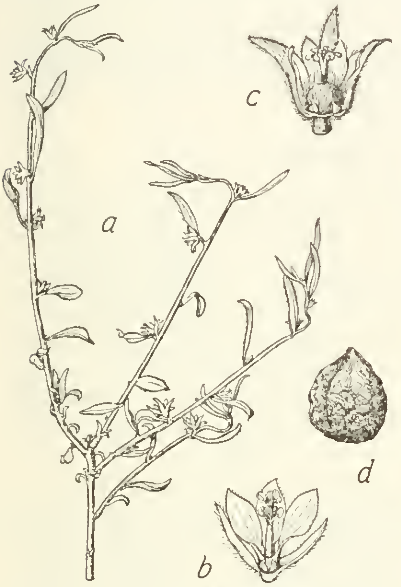

Fig. 217. ARGYTHAMNIA SERICOPHYLLA Gray. *a*, flowering branch, × ½; *b*, long. sect. of staminate fl., × 3; *c*, long. sect. of pistillate fl., × 3; *d*, seed, × 5.

3. **A. clariana** Jepson sp. n. Stems many, diffusely spreading, 1 to 1½ feet high, freely branched; herbage thinly hairy; leaf-blades lanceolate, sometimes ovate, 7 to 14 lines long, the gland-tipped teeth slenderly acuminate or bristle-like; bracts lanceolate, their teeth prolonged into a very slender gland-tipped acumination; flowers 2½ to 3 lines long; sepals of pistillate flower with gland-tipped teeth or bristles; sepals of staminate flower narrowly linear-lanceolate, entire or subentire, not glandular, obscurely whitish-margined; petals of staminate flower lanceolate, crisped, pinkish and red-veined; petals of pistillate flower ovate, white, not red-veined or crisped.—(Caules multi, diffusi, ped. 1–1½ longi; folia lanceolata, dentibus gracilis, acuminatis, glandulosis; bracteae lanceolatae, dentibus elongatis in mucrones gracillimos glanduliferes productis; floris pistillati sepala bracteis similia, floris staminati anguste lineari-lanceolata, integra vel subintegra, eglandulosa, obscure albo-marginata; nuculae foveo-reticulatae, glaucae, papillatae, obscure lineatae.)

Sandy benches or desert flats, 0 to 300 feet: Coachella Valley. East to Arizona. Dec.-Mar.

Tax. note.—The size of the staminate flower is about the same as the pistillate, but the calyces of the two differ conspicuously in that the slender or bristle-tipped glands of the pistillate flower are quite absent in the staminate flower. In Argythamnia serrata the staminate flower is about one-half the size of the pistillate flower, and both are wholly glandless. In A. clariana the herbage is dark or slightly cupreous, in A. serrata it is whitish.

Locs.—Santa Rosa Mts. (base of, 10 mi. w. of Coachella), *Marjorie Clary* 1707 (type); Coral Reef Ranch, *Clary* 1709; Indio, *Jones*. Ariz.: Needles Mts., *J. Grinnell*.

4. **A. californica** Bdg. Stems several from a woody root-crown, spreading, 3 to 12 inches long; herbage glabrous; leaf-blades obovate, serrulate, abruptly short-acute, mostly petioled, ¾ to 1½ inches long; sepals linear-lanceolate, serrulate, with a whitish margin; sterile whorl of stamens as in no. 1; petals white, greenish-tinged; seeds brownish, reticulated with bead-like ridges, the intervals lineate.

Rocky cañon floors, 400 to 800 feet: desert side of Santa Rosa Mts. Jan.-Apr.

Locs.—This plant, a well-marked endemic, is thus far known only from two localities on the east edge of the Santa Rosa Mts. in the Colorado Desert, Marshall Cañon and Deep Cañon. At the latter station it has been collected by Marjorie Clary (no. 1754), who in January, 1933, found only three flowering plants and one seedling.

Refs.—ARGYTHAMNIA CALIFORNICA Bdg. Zoe 5:230 (1906), type loc. Marshall Cañon, 7 mi. w. of Coachella, *Hall* 5796. *Ditaxis californica* Pax & Hoffm.; Engler, Pflzr. 4^{147-6}:70 (1912).

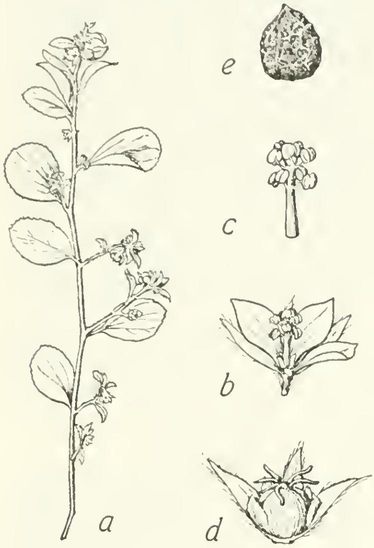

Fig. 218. ARGYTHAMNIA SERRATA Muell. Arg. *a*, flowering branch, × ½; *b*, long. sect. of staminate fl., × 5; *c*, stamen-column, × 10; *d*, long. sect. of pistillate fl., × 4; *e*, seed, × 5.

6. BERNARDIA Houst.

Shrubs with alternate stipulate leaves. Flowers monoecious (in ours) or dioecious, in small spikes or racemes. Staminate flowers with 3 to 5-parted valvate calyx; stamens 3 to 20, distinct, on a central receptacle. Pistillate flowers with 6 (sometimes 3 or 9)-parted imbricate calyx; ovary 3-celled, 3-ovuled; stigmas nearly sessile, 2-lobed. Seeds without caruncle.—Species 24, North and South America. (P. F. Bernard, 1749–1825, French botanist.)

1. **B. myricaefolia** Wats. Stems many, erect, 3 to 7 feet high, the herbage grayish with a fine but often dense stellate pubescence; leaf-blades thick, ovate, serrate, prominently veined, ¼ to 1½ inches long, on short (¼ to 1 line) petioles; staminate flowers in axillary racemose clusters; stamens 4 to 8; pistillate flowers terminal, sessile; capsules globose, densely stellate-tomentulose, 5 to 7 lines in diameter; seeds subglobose, smooth, 3 to 4 lines long.

Rocky cañons, 500 to 2500 feet: southern Mohave Desert; mountains on north and west sides of the Colorado Desert. South to Lower California and Mexico. Apr.

Locs.—Mohave River headwaters (Bot. Cal. 2:70); Cottonwood Spr., Cottonwood Mts., *Jepson* 12,563; pass betw. San Felipe Valley and Grapevine Cañon, e. San Diego Co., *Jepson* 8775.

Refs.—BERNARDIA MYRICAEFOLIA Wats. Bot. Cal. 2:70 (1880); Jepson, Man. 597 (1925). *Tyria myricaefolia* Scheele, Linnaea 25:581 (1852), type loc. Neubraunfels, Tex., *Lindheimer* (523, 524 acc. Muell. Arg. Linnaea 34:154). *Ricinella myricaefolia* Muell. Arg. Linnaea 34:154 (1865).

7. ACALYPHA L.

Herbs or shrubs with serrate stipulate leaves. Flowers monoecious, in catkin-like spikes. Staminate spikes small; calyx 4-parted, valvate; stamens 7 to 9, usually 8, distinct, on a raised central receptacle. Pistillate spikes short, or the pistillate flowers often solitary or few at the base of the staminate spikes; calyx shallowly 8-lobed; ovary 3-celled, 3-ovuled; styles 3, red, in ours filiform-dissected.—Species about 350, chiefly tropical, all continents except Europe. Capsule often surrounded by the enlarged bract. (Greek akalephes, a nettle.)

1. **A. californica** Benth. Low shrub; herbage puberulent, the leaves a little glandular; leaf-blades ovate-cordate, 3 to 10 inches long, short-petioled; spikes peduncled, the staminate 4 to 10 lines long, about 1 line broad, the pistillate 2 to 3 lines long.

Dry hills, 1000 to 4500 feet: San Diego Co. South to Lower California. June.

Locs.—Ramona, *T. Brandegee;* Poway, *Parish* 4430; Lakeside, *T. Brandegee;* San Diego, *McClatchie;* Jamul, *Hall.*

Refs.—ACALYPHA CALIFORNICA Benth. Bot. Sulph. 51 (1844), type loc. Magdalena Bay, L. Cal., *Hinds;* Jepson, Man. 597 (1925). *Ricinocarpus californicus* Ktze. Rev. Gen. Pl. 2:617 (1891).

8. RICINUS L.

Herb or shrub. Leaves large, the blades peltate, palmately lobed. Flowers monoecious, in terminal racemes, the upper flowers pistillate, the lower staminate. Stamens many, the anthers erect in the bud; filaments much branched, each with many anthers. Styles 3, united at base, plumose, red. Capsule large, bur-like, 3-lobed; seeds 3, with large caruncle.—Species 1. (Latin name, the seeds resembling ticks.)

1. **R. communis** L. CASTOR BEAN. Shrub 3 to 8 feet high; leaf-blades 7 to 11-cleft, ½ to 1 (or 2) feet wide.

Native of Africa, widely distributed through introduction in all warm regions, with us cultivated and locally naturalized: coastal Southern California. July-Oct.

Locs.—Anaheim, *Parish* 1599; Los Angeles (Erythea 1:100).

Refs.—RICINUS COMMUNIS L. Sp. Pl. 1007 (1753), East and West Indies, Afr., s. Eur.; Jepson, Man. 597 (1925).

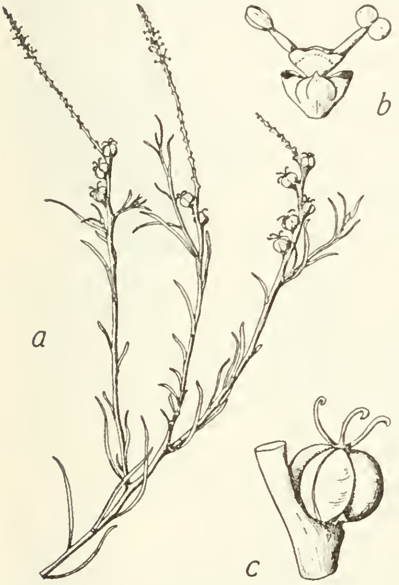

Fig. 219. STILLINGIA LINEARIFOLIA Wats. *a*, flowering branch, × ½; *b*, staminate fl., × 8; *c*, pistillate fl, × 3.

9. STILLINGIA L.

Glabrous herbs. Flowers monoecious, disposed in spikes which are pistillate at base. Bracts conspicuously biglandular, the glands trumpet-shaped or saucer-shaped and pedicellate. Calyx imbricate in the bud. Staminate calyx thin or scarious, in ours 2-parted; stamens in ours 2; anthers erect in the bud. Pistillate calyx in ours none; ovary 3-celled, each cell 1-ovuled; styles 3, nearly distinct, simple. Capsule-lobes breaking away from a 3-horned base. Seeds usually carunculate.—Species about 15, North and South America, and Pacific Ocean islands. (Benj. Stillingfleet, 1702–1771, London student of the ancient Greek plants.)

Leaves narrowly linear-lanceolate, entire or nearly so; central column of capsule persistent; stems tall, rush-like........1. *S. linearifolia.*
Leaves ovate, pectinately serrate; central column of capsule none; stems short, very leafy........2. *S. spinulosa.*

1. **S. linearifolia** Wats. (Fig. 219.) Rush-like perennial with a tuft of slender stems 3 feet high; leaf-blades narrowly linear-lanceolate, entire, 1 to 1½ inches long; spikes mostly terminal.

Sandy mesas, dry hills and plains, 1000 to 2500 feet: Colorado Desert; interior of cismontane Southern California. Apr.-May.

Locs.—Cottonwood Spr., *Jepson* 12,594; San Bernardino foothills, *Parish* 842; Redlands, *R. J. Smith;* Beaumont, *Gilman;* San Jacinto, *Gregory;* Coyote Cañon, Santa Rosa Mts., *Hall* 2837; betw. Cahuilla Valley and Aguanga, *Jepson* 1482; Dehesa, San Diego Co., *T. Brandegee;* Mason Valley, e. San Diego Co., *Jepson* 8644.

Var. **paucidentata** Jepson. Leaf-blades with 2 or 3 setaceous teeth on each side near the base; seeds slightly carunculate.—Dry plains, 2000 to 3000 feet: Mohave Desert; Inyo Co.

Locs.—Victorville, *Loughridge;* Kramer, *Jepson* 5327; Barstow, *Jepson* 5825; Searles Lake, Inyo Co., *Jepson* 7151; Little Owens Lake (Contrib. U. S. Nat. Herb. 4:195).

Refs.—STILLINGIA LINEARIFOLIA Wats. Proc. Am. Acad. 14:297 (1879), type loc. Boundary Monument, San Diego, *Palmer* 449; Jepson, Man. 598 (1925). *S. gymnogyna* Pax & Hoffm.; Engler, Pflzr. 4^{147-4}:196 (1912). Var. PAUCIDENTATA Jepson, l.c. *S. paucidentata* Wats. l.c. 298, type loc. Colorado Valley near mouth of Williams River, Ariz., *Palmer* 517.

2. **S. spinulosa** Torr. (Fig. 220.) Tufted annual or perennial, 3 to 6 inches high; leaf-blades ovate, spinulose-serrate, acuminate, 1 to 1½ inches long, narrowed to a short petiole; spikes mostly axillary; glands at base of bracts somewhat trumpet-shaped.

Desert mesas or washes, 50 to 2500 feet: Mohave Desert; Colorado Desert. Mar.-May.

Locs.—Mohave Desert: Danby, *T. Brandegee;* Lavic, *Jepson* 15,478; Daggett, *K. Brandegee.* Colorado Desert: McCoy Wash, *Hall* 5927; Conchilla Desert, *Jepson* 6058; Borrego Spr., *Jepson* 8880.

Refs.—STILLINGIA SPINULOSA Torr.; Emory, Notes Mil. Rec. 152 (1848), type loc. desert west of the Colorado River, *Emory. Sapium annuum* Torr. Bot. Mex. Bound. 201 (1859), desert west of the Colorado River, *Emory,* and near Ft. Yuma, *Schott. Stillingia annua* Muell. Arg.; DC. Prod. 15^2: 1160 (1866); Jepson, Man. 598 (1925).

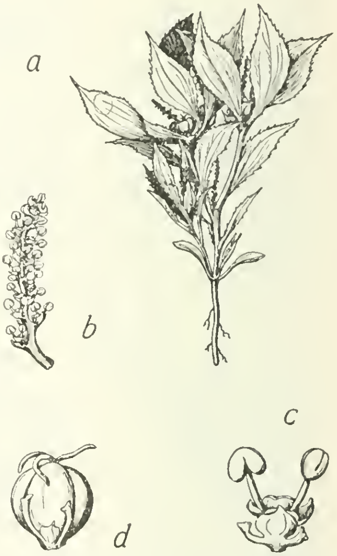

Fig. 220. STILLINGIA SPINULOSA Torr. *a*, habit, × ½; *b*, staminate infl., × 2; *c*, staminate fl., × 8; *d*, pistillate fl., × 3.

10. TRAGIA L.

Perennial herbs. Stems slender, wiry, beset with stinging hairs. Leaves small, coarsely toothed, short-petioled. Flowers monoecious, in small clusters at the ends of the branches. Staminate flower: sepals 3 to 5; stamens commonly 3 (4 to 6). Pistillate flower: sepals 5 (or 6); ovary with one ovule in each cell.—Species about 100, all continents save Europe, but chiefly in the tropics or subtropics. (Dedicated to the German herbalist Hieronymus Bock, 1498–1554, his surname latinized as Tragus, goat.)

1. **T. ramosa** Torr. Stems several to many, erect, little branched, 6 to 12 inches high; herbage hirsute; leaf-blades lanceolate, sharply serrate, 6 to 11 lines long, the petioles ½ to 2 lines long; stamens 4 or 5; capsule hirsute.

Dry hills, 4000 to 6000 feet: Providence Mts. East to Missouri and Texas.

Refs.—TRAGIA RAMOSA Torr. Ann. Lyc. New York 2:245 (1828), type loc. near or on headwaters of the Canadian River (probably northern New Mexico), *James;* Jepson, Man. 1170 (1925).

11. MERCURIALIS L.

Erect herbs with opposite leaves. Flowers small, green, mostly dioecious, in little axillary clusters, the pistillate clusters sessile or subsessile, the staminate clusters on peduncles. Calyx 3-parted. Corolla none. Staminate flowers with 8 to 20 stamens. Pistillate flowers with a 2-celled, 2-lobed ovary, 2 styles and 1, 2 or 3 sterile filaments. Capsule 2-celled, the cells 1-seeded.—Species 7, Europe, Asia and Africa. (Of the god Mercury.)

1. **M. annua** L. Herb Mercury. Glabrous annual 6 to 15 inches high; nodes on lower part of stems swollen; leaf-blades ovate to oblong, serrate, 1 to 2 inches long; petioles 2 to 7 lines long; staminate clusters in interrupted spikes, the spikes borne on peduncles 1 to 1½ inches long; pistillate flowers 2 or 3 in the axils, shortly pediceled; lobes of the fruit with a shallow longitudinal channel on the back, the dorsal areas softly spinose.

European weed, locally naturalized: San Mateo Co. Mar.

Locs.—Montara Mt., valley near, *V. Duran;* Pedro Valley, *Abrams & Wiggins* 180.
Ref.—Mercurialis annua L. Sp. Pl. 1035 (1753), type European.

12. EUPHORBIA L. Spurge

Herbs or shrubs. Involucres solitary in the forks or disposed in terminal cymes, with 4 or 5 teeth or lobes alternating with glands borne in the sinuses; glands either naked or appendaged (that is, with a colored margin). Flowers monoecious, both pistillate and staminate naked and included in an involucre which itself resembles a flower but really encloses a cluster of flowers consisting of several staminate and 1 pistillate flower. Staminate flower very much reduced, consisting of a single stamen; filament jointed on a short pedicel like it, the pedicel often with a minute scale or bract at base, showing that the stamen is a distinct flower. Pistillate flower supported on a pedicel in the center of the involucre and soon protruded from it, consisting of a 3-celled ovary and 3 bifid styles. Capsule with 3 cells, each 1-seeded. —Species over 600, all continents, chiefly warm temperate and subtropical, absent from the arctic. (Euphorbus, King Juba's physician.)

Bibliog.—Greene, E. L., Some species of Euphorbia, section Anisophyllum (Bull. Cal. Acad. 2:56–58,—1886). Millspaugh, C. F., Euphorbiaceous plants * * * of Lower California (Proc. Cal. Acad. ser. 2, 2:217–230,—1889); Euphorbia serpyllifolia and its forms (Pitt. 2:82–86, pl. 1,—1890); New or noteworthy species [of Euphorbia] (l.c. 2:87–90,—1890); Notes on the Euphorbias of Dr. Edward Palmer's Durango (Mexico) collection of 1896 (Bot. Gaz. 25:13–25,—1898); Notes and new species of the genus Euphorbia (Bot. Gaz. 26:265–270,—1898); [Chamaesyce and other genera] (Field Mus. Publ. Bot. 2:401–420,—1916). Norton, J. B. S., A revision of Am. species of Euphorbia of the section Tithymalus occurring north of Mexico (Rep. Mo. Bot. Gard. 11:85–144, pls. 11–52,—1899).

A. STEM LEAVES OPPOSITE, OBLIQUE AT BASE (NOT OBLIQUE IN NO. 5); GLANDS 2 TO 4, USUALLY WITH A PETAL-LIKE WHITE OR REDDISH APPENDAGE (OR THIS SOMETIMES LACKING IN NOS. 8, 9 AND 11).—Subgenus CHAMAESYCE.

1. Leaf-blades serrate or serrulate; stipules distinct; annuals.

Plants erect or nearly so; herbage glabrous or slightly hairy; stipules triangular, entire or slightly lacerate; capsule obtusely angled..........1. *E. nutans.*
Plants usually prostrate.
Herbage glabrous; stem and leaves mostly green or greenish, infrequently reddish; seeds quadrate-oblong or -ovate, smooth or irregularly rugulose..........2. *E. serpyllifolia.*
Herbage hairy or puberulent; leaves often reddish or red-spotted.
Capsules sparsely long-villous to glabrate; pubescence of young stems sparse, long-silky; leaves reddish or green, but not spotted..........3. *E. hirtula.*
Capsules pubescent, the hairs coarse, more or less appressed; pubescence of young stems coarse, spreading; leaves often with a central red spot..........4. *E. maculata.*

2. Leaf-blades entire.

Annuals.
Leaf-blades linear; herbage glabrous..........5. *E. parryi.*
Leaf-blades broader, roundish, ovate or obovate to oblong.
Herbage pubescent; leaf-blades round-ovate to oblong; seeds oblong, acutely 4-angled; Colorado Desert.
Seeds slightly rugose transversely; herbage glandular-pubescent..........6. *E. setiloba.*
Seeds with 4 deep transverse grooves; herbage cinereous-pubescent..........7. *E. pediculifera.*
Herbage commonly glabrous; leaf-blades deltoid-ovate or oblong-ovate to elliptic; seeds usually more or less round-ovate.
Seeds broadly cylindric-ovate; glands entire, usually without appendages..........8. *E. ocellata.*

Seeds round on back, flattish on face, very smooth; glands 2-toothed or -horned on the outer margin.......9. *E. cremica.*

Perennials; leaf-blades orbicular to round-ovate or oblong; seeds usually smooth.

Stipules of the contiguous leaf-pairs united into a conspicuous white-membranous triangular scale; glands orange or brownish.......10. *E. albomarginata.*

Stipules distinct, short-triangular to lanceolate, ciliate, minute; glands dark purple (sometimes yellow).

Herbage glabrous or minutely hirsutulous; leaves green or reddish.......11. *E. polycarpa.*

Herbage densely pubescent, the leaves pale or whitish.

Gland-appendages non-ciliate; leaves usually 1 to 3 lines long....12. *E. melanadenia.*

Gland-appendages ciliate; leaves 2½ to 4 lines long.......13. *E. vallis-mortae.*

B. LEAVES MOSTLY ALTERNATE, MOSTLY NOT OBLIQUE AT BASE; GLANDS 5 OR 4; PLANTS NEVER PROSTRATE.

Glands of the involucre with a colored membranous appendage; pedicels of the flowers with a minute scale at base; leaf-blades round-obovate, entire; shrub.—Subgenus TRICHOSTERIGMA.......14. *E. misera.*

Glands of the involucre without an appendage; herbs, the stems erect or ascending.

Leaf-blades linear, entire or nearly so; involucres in terminal head-like clusters; stipules gland-like, minute; glands cup-shaped; annual or biennial.—Subgenus POINSETTIA.. 15. *E. eriantha.*

Leaf-blades ovate, obovate or rotund, never linear; involucres in dichotomous or often umbellate cymes; stipules none.—Subgenus TITHYMALUS.

Glands discoid, entire; capsule with warty lobes; leaves serrulate; annual....... 16. *E. dictyosperma.*

Glands not entire, variously denticulate, lacerate, or horned; leaves entire.

Annual (sometimes biennial).

Capsule smooth; stem leaves sessile or nearly so.......17. *E. crenulata.*

Capsule crested; stem leaves petiolate.......18. *E. peplus.*

Perennial; capsule smooth.

Glands rather longer than broad, 2-horned; leaves strongly obtuse....... 19. *E. palmeri.*

Glands often much broader than long, a little lacerate, not horned; leaves cuspidate, often acute.......20. *E. schizoloba.*

1. **E. nutans** Lag. LARGE SPURGE. Stems simple below or branched from the base, erect or ascending, 9 to 14 inches high; herbage glabrous or scantily pilose; leaf-blades broadly oblong, slightly cordate at base, serrulate, often reddish, or red-spotted, 5 to 12 lines long; stipules triangular, entire or somewhat lacerate; involucres in a small terminal panicle of cymes; involucres red-brown; glands small, their margins white or red, entire; capsule glabrous, obtusely angled; seeds ashy black, obtusely angled, with 2 or 3 broken transverse ridges.

Hill country, 200 to 1300 feet: Sierra Nevada foothills from Butte Co. to Placer Co. East to the Atlantic, south to Mexico. Sept.

Locs.—Auburn, *Amundsen;* Big Chico Creek, *Heller* 11,139.

Refs.—EUPHORBIA NUTANS Lag. Gen. et Sp. Pl. Nov. 17 (1816), type from "Nova Hispania". *E. preslii* Guss. Fl. Sic. Prod. 1:539 (1827); Jepson, Man. 599 (1925). *E. hypericifolia* Gray, Man. 407 (1848); Jepson, Fl. W. Mid. Cal. 262 (1901), ed. 2, 246 (1911); not E. hypericifolia L. (1753). *Chamaesyce nutans* Small, Fl. Se. U. S. 712 (1903). *C. preslii* Arthur, Torreya 11:260 (1911).

2. **E. serpyllifolia** Pers. THYME-LEAF SPURGE. Stems round, or more or less angled, repeatedly branched, forming prostrate mats 1 to 3 feet across; herbage glabrous and green; leaf-blades oblong-elliptic or obovate-spatulate, more or less minutely serrate toward the apex or subentire, 2 to 3 lines long; stipules setaceous or lacerate; involucres campanulate, solitary or in loose clusters, ½ line long or less; glands transversely oblong and more or less cupped in the center, the wing white, narrow, crenately serrate or nearly entire; capsules smooth, the lobes carinate; seeds clay-white, sharply quadrangular, smoothish, rugulose or rugose-pitted, grayish-white or tan, slightly over ½ line long.

Valleys and plains, 10 to 6000 feet: throughout California. North to British Columbia, east to Minnesota and Texas, south to Mexico. June-Dec.

Note on variation.—In this widely distributed species the interlocking of variable characters renders unprofitable any effort to establish a series of well-marked local races or varieties. The plants are usually prostrate in habit but specimens with the branches diffuse to ascending are not uncommon. The form Euphorbia consanguinea Engelm. is based upon red coloration of the herbage, more sharply serrate obtuse (not truncate) leaflets, and in part upon a more erect habit; but these three characters are only rarely associated, so that this form is too indefinite. The glabrous condition of E. serpyllifolia seems a constant character. The leaves, although characteristically serrate at the apex, vary considerably as to the amount of toothing and plants with some or most leaves entire are not uncommon, especially in Humboldt and adjoining counties. The seeds, as in the case of most California species of Euphorbia, are at maturity covered with a waxy coating which is at first white or ashy gray, later, apparently, becoming a light tan or clay color. When the coating is removed, or before maturity, the seed color is reddish; when still thin the color may be shell pink. The shape of the seeds in E. serpyllifolia varies from rather narrowly quadrate-oblong to quadrate-ovoid and the surface of the facets from smooth to rugulose. The var. rugulosa Engelm. represents a local race of San Bernardino and Los Angeles counties with the seed surface very minutely vermicular-rugulose. In northern California seeds with smooth as well as very rugulose facets are common, especially in Humboldt County and the lower Sacramento region. The surface rugosities are, however, coarser than in typical specimens of the var. rugulosa from the south. Taking the group as a whole no satisfactory segregation is possible on the basis of seed rugosity. It has therefore seemed advisable to retain within the species proper all those forms which do not exhibit the distinctive surface of var. rugulosa.

Locs.—Coast Ranges: Yreka, *Butler* 70; Sisson, Siskiyou Co., *Geo. B. Grant* 5068; Trinity River Valley near the South Fork, *Tracy* 6555; South Fork Eel River (near mouth), *Tracy* 4769; Hyampum, Humboldt Co., *Chesnut & Drew* (type collection of E. occidentalis Drew); Covelo ranger sta., ne. Mendocino Co., *Cronemiller* 663; Hopland, Mendocino Co., *Jepson* 9436; Putah Creek near Middleton, Lake Co., *M. S. Baker* 2320a; Healdsburg, *M. S. Baker;* St. Helena, *Jepson* 13,929; Napa, *Jepson* 13,928; Benicia, *Jepson* 13,931; Olema, Marin Co., *Curran;* Stanford, *C. F. Baker* 195. Great Valley: Princeton, Colusa Co., *Chandler;* Putah Creek near Winters, *Jepson* 13,933; Elmira, Solano Co., *Jepson* 12,379; Stockton, *Davy* 1174; Lathrop, *H. A. Walker* 910 (leaves entire); Union Isl., San Joaquin Co., *Jepson* 10,274. Sierra Nevada: Egg Lake, Modoc Co., *M. S. Baker;* upper Fall River Valley, ne. Shasta Co., *Jepson* 5760; Montgomery Creek, Shasta Co., *M. S. Baker;* Martin Sprs., Eagle Lake, *Brown & Wieslander* 90; Bucks Valley, Plumas Co., *Jepson* 10,643; Bear Valley, Nevada Co., *Jepson* 13,927; Donner Lake, *Heller* 6935; Ione, Amador Co., *Braunton* 1128 (plants erect); Dorrington, Calaveras Co., *Jepson* 10,112; Deadman Creek, Tuolumne Co., *Jepson* 6559; Hetch-Hetchy, *Jepson* 3480; Yosemite, *Jepson* 8362; Fresno Big Trees, *Jepson* 15,985; Kings Cañon, *Jepson* 777. Southern California: North Fork San Gabriel River, *Peirson* 2445; Lytle Creek, *Parish;* Strawberry Valley, Riverside Co., *Hall* 2532 (intermediate toward var. rugulosa); Newport, *Alice King.* The following spms. from northerly localities have seeds quite as rugulose but more coarsely so than those of typical var. rugulosa: Fall River, Shasta Co., *Hall & Babcock* 4212; Lathrop, San Joaquin Co., *Bioletti;* Del Mar, Santa Cruz Co., *K. Brandegee.* The following spms. with ascending branches and leaves with sharply serrate rounded apex represent the state described as E. consanguinea Engelm.: Eastberne, San Bernardino Co., *H. S. Budd* (seeds very rugulose); Yreka, Siskiyou Co., *Butler* 445 (seeds shallowly wrinkle-pitted).

Var. **rugulosa** Engelm. Plants often erect; herbage often reddish; leaves usually more serrate on the larger side of the blade; seeds minutely vermicular-rugulose.—Dry valleys or mesas, 900 to 1000 feet: cismontane in Los Angeles and San Bernardino Cos. May-Nov.

Locs.—Santa Catalina Isl., *K. Brandegee;* Pomona, *Davy;* Bloomington, San Bernardino Valley, *Parish* 10,289.

Refs.—EUPHORBIA SERPYLLIFOLIA Pers. Syn. 2:14 (1807), type from "Mexico" (at that time extending north to the forty-second parallel); Jepson, Fl. W. Mid. Cal. 262 (1901), ed. 2, 246 (1911), Man. 599, fig. 592, (1925). *Chamaesyce serpyllifolia* Small, Fl. Se. U. S. 712, 1333 (1903). *E. serpyllifolia* var. *consanguinea* Boiss.; DC. Prod. 15^2:43 (1862), type loc. Lake Winnipeg, *Bourgeau* (Engelmann's spms., however, came from "Kansas and Texas" or California); Jepson, Fl. W. Mid. Cal. l.c., ed. 2, l.c. *E. inaequilatera* Engelm. Bot. Mex. Bound. 2:187 (1859); not E. inaequilatera Sonder (1850). *E. consanguinea, E. subserrata, E. notata* Engelm.; Boiss. l.c., as synonyms. *E. sanguinea* Greene, Bull. Cal. Acad. 2:56 (1886); not E. sanguinea Hochst. & Steud. (1862). *Chamaesyce consanguinea* Millsp. Field Mus. Publ. Bot. 2:408 (1916). *E. occidentalis* Drew, Bull. Torr. Club 16:152 (1889), type loc. Hyampum Valley, Humboldt Co., *Chesnut & Drew;* Jepson, Man. 599 (1925). *E. serpyllifolia* var. *occidentalis* Jepson, Fl. W. Mid. Cal. 262 (1901), ed. 2, 246 (1911). *Chamaesyce occidentalis* Millsp. l.c. 410. Var. RUGULOSA Engelm.; Millsp. Pitt. 2:85 (1890), type loc. San Bernardino, *S. B. & W. F. Parish;* Jepson, Fl. W. Mid. Cal. l.c., ed. 2, l.c., Man. l.c. *E. rugulosa* Greene, Fl. Fr. 92 (1891). *Chamaesyce rugulosa* Rydb. Bull. Torr. Club 33:145 (1906).

3. **E. hirtula** Engelm. Pine Spurge. Stems prostrate or slightly ascending, 2 to 9 inches long; herbage villous; leaf-blades roundish-oval to elliptic-oblong, oblique at the base, 1½ to 3 lines long; stipules fimbriate; involucres turbinate-campanulate, solitary in the axils; glands red, with a narrow white toothed appendage; capsules sparsely villous, ¾ to 1 line long, acutely angled; seeds ovate-quadrate, grayish-white, acutely angled, shortly wrinkle-pitted or slightly wrinkled, ½ line long.

Montane, mostly in the pine belt, 1400 to 5500 feet: Sierra Nevada from Calaveras Co. to Fresno Co.; mountains of coastal Southern California. South to Lower California. June-Oct.

Locs.—Sierra Nevada: Kentucky House, South Fork Calaveras River, *Jepson* 10,042; Hetch-Hetchy, *Hall & Babcock* 3356; Cedar Brook, Mariposa Co., *Jepson* 15,964; Pine Ridge, Fresno Co., *Hall & Chandler.* S. Cal.: Strawberry Valley, San Jacinto Mts., *Hall* 966; Ramona, San Diego Co., *K. Brandegee;* Julian, *T. Brandegee;* Cuyamaca, *T. Brandegee.*

Refs.—Euphorbia hirtula Engelm.; Wats. Bot. Cal. 2:74 (1880), type loc. near San Diego, *Cleveland;* Jepson, Man. 599 (1925). *Chamaesyce hirtula* Millsp. Field Mus. Publ. Bot. 2:409 (1916).

4. **E. maculata** L. Spotted Spurge. Stems radiately branching, prostrate, 3 to 10 inches long; herbage pilose; leaf-blades oblong-elliptic to oblong-linear, usually with a red blotch in center, serrulate, obliquely subcordate at base, 1½ to 5 lines long; stipules setaceous, sometimes lacerate, fimbriate or crenulate; involucres narrowly turbinate, ½ line long; glands 4, cup-shaped, with white entire margins; capsules acutely angled, sparsely and coarsely appressed-pubescent, ⅔ line long; seeds quadrate-oblong, reddish or brown, ¼ line long, the sides transversely ridged.

Introduced from eastern United States: street weed about cities and towns. July-Oct.

Locs.—Marysville, *Hall* 9835; Bear Valley, Nevada Co., *Jepson* 13,924; Ione, Amador Co., *Braunton* 1137; West Berkeley, *Bioletti;* Jolon, Monterey Co., *Jepson* 1650; San Miguel, San Luis Obispo Co., *K. Brandegee* (seeds brown, with shallow ridges); Pasadena, *Geo. B. Grant* 427; San Bernardino, *Parish* 9430.

Refs.—Euphorbia maculata L. Sp. Pl. 455 (1753), type from North America; Jepson, Fl. W. Mid. Cal. 262 (1901), ed. 2, 246 (1911), Man. 600 (1925). *Chamaesyce maculata* Small, Fl. Se. U. S. 713 (1903).

5. **E. parryi** Engelm. Drift Spurge. Branched from the base, diffuse to ascending, 6 to 12 inches high; herbage glabrous; stipules subulate, fimbriate; petioles very short; leaf-blades linear, 5 to 11 lines long, acute at both ends, the margins involute in drying; cymes terminal, 1 to 3-involucred; involucres campanulate, ½ to 1 line long; glands greenish, concave, the outer margin somewhat produced; appendages none; capsules smooth, 1 line long, the lobes acutely angled; seeds ovate, acutely 3-angled, minutely rugulose, ½ line long.

Sandy areas, 1300 to 1600 feet: eastern Mohave Desert. East to Utah. June-Sept.

Loc.—Devils Playground, *K. Brandegee,* the only known locality in California.

Refs.—Euphorbia parryi Engelm. Am. Nat. 9:350 (1875), type loc. St. George, s. Utah, *Parry. Chamaesyce parryi* Rydb. Bull. Torr. Club 40:53 (1913).

6. **E. setiloba** Engelm. Yuma Spurge. Stems repeatedly dichotomous from the base, prostrate, 2 to 6 inches long; herbage reddish, softly glandular-pubescent; leaf-blades round-obovate to elliptic, entire, 1 to 3 lines long, on slender petioles; stipules minute, low-triangular; involucres solitary in the axils and in small leafy clusters terminating the branchlets, narrowly turbinate, the lobes ciliolate; glands erect, purple, the margins white or rose-color, narrow, fimbriate; capsules hairy, angled, ½ line long; seeds oblong, ashy pink, acutely 4-angled, slightly rugose transversely, ⅓ line long.

Sandy soil, 50 to 2500 feet: mountains bordering the Colorado Desert. East to Arizona, south to Lower California. Mar.-Oct.

Locs.—Riverside Mt., Colorado River, *J. Grinnell;* Mountain Sprs., e. San Diego Co., *Parish* 9034.

Var. **nodulosa** Jepson var. n. Nodes somewhat annular-dilated; gland-appendages obsolete or nearly so.—(Nodi paulo annulato-dilatati; glandulae appendices obsoletae vel subobsoletae.) —River bottoms or low desert flats, –115 to 150 feet. Colorado Desert: betw. Brawley and Salton Sea, *Parish* 8301 (type); Ft. Yuma, *Parish* 8307.

Refs.—EUPHORBIA SETILOBA Engelm. Pac. R. Rep. 5:364 (1857), type loc. near Ft. Yuma, Ariz.; Jepson, Man. 600 (1925). *Chamaesyce setiloba* Millsp.; Parish, Carnegie Inst. Wash. Publ. 193:110 (1914). Var. NODULOSA Jepson.

7. **E. pediculifera** Engelm. CARRIZO SPURGE. Stems pubescent throughout, slender, procumbent, much branched, 1 foot long; herbage finely cinereous or scurfy; leaf-blades oblong to obovate, entire, moderately but distinctly unequal at base, 3 to 4½ lines long, on slender petioles; stipules very small, triangular; involucres hemispherical, clustered on short axillary branchlets; glands large, purple, the margins conspicuous, white, shortly fan-shaped, crenulate; styles bifid almost to the base, divaricate; capsule broadly ovate, pubescent, the lobes not carinate; seeds ashy pink or gray, 4-angled, the facets with 4 straight and deep transverse grooves.

Cañons, 500 to 1500 feet: Colorado Desert. East to Arizona, south to Mexico. Apr.

Loc.—Carrizo Mt., *T. Brandegee,* the only station known to us in California.

Var. **abramsiana** Ewan comb. n. Glands small, inconspicuous, the appendages minute or obsolete.—Sandy areas, –150 to 0 feet, Colorado Desert: Calexico, *Parish* 8302; Brawley, *Parish* 8305. Oct.

Refs.—EUPHORBIA PEDICULIFERA Engelm. Bot. Mex. Bound. 2:186 (1859), type loc. Sonora, Mex., *Wright* 1848; Jepson, Man. 600 (1925). *Chamaesyce pediculifera* Rose & Standl. Contrib. U. S. Nat. Herb. 16:12 (1912). Var. ABRAMSIANA Ewan. *E. abramsiana* Wheeler, Bull. S. Cal. Acad. 33:109 (1934), type loc. Heber, Imperial Co., *Abrams* 4097. *Chamaesyce saltonensis* Millsp.; Parish, Carnegie Inst. Wash. Publ. 193:110 (1914), Calexico, Imperial Co., *Parish* 8302, nomen nudum.

8. **E. ocellata** D. & H. CANTUA SPURGE. Stems many from the base, prostrate, 5 to 13 inches long; herbage glabrous; leaf-blades deltoid to oblong-ovate, thickish, unequal and often cordate at base, entire, 2 to 5½ lines long; stipules subulate, mostly entire; involucres hemispheric (or turbinate), 5-columnar, nearly 1 line long, the lobes fringed; glands 2 to 4, saucer-shaped, yellowish or purplish, short-stipitate, without appendages; capsule strongly 3-lobed, smooth, 1 line long; seeds round-ovate, dorsally carinate (or sub-quadrate), nearly smooth or somewhat wrinkled, brown, gray, ashy or whitish, ⅔ line long.

Dry sandy valleys and foothills, 10 to 1500 feet: inner South Coast Range; Great Valley; Sierra Nevada; Southern California. East to Nevada. Aug.-Oct.

Locs.—Dunsmuir, Siskiyou Co., *Jepson* 6159; Table Mt., Oroville, *Heller* 11,143; San Joaquin Co., *Sanford* 175 (involucres turbinate); Mt. Diablo, *Jepson* 13,926; Corral Hollow, Alameda Co., *Brewer* 853; Cantua Creek, w. Fresno Co., *Lillis;* La Grange, Stanislaus Co., *Jepson* 13,925; Agua Fria, Mariposa Co., *Congdon;* North Fork Kaweah River, *Jepson* 577; Tulare, *Michener & Bioletti* (seeds nearly smooth); San Bernardino, *Parish* 2056.

Var. **arenicola** Jepson. Glands sessile or nearly so; seeds very smooth, subspherical.—Sandy plains or hills, 1000 to 2000 feet: Mohave Desert, north to Inyo Co. East to Arizona. May.

Locs.—Camp Cady (Daggett), *Parish* 1370; Soda Lake near Baker, e. Mohave Desert, *Parish* 10,375; Searles Lake, Inyo Co., *Jepson* 7144.

Var. **sulfurea** Jepson comb. n. Seeds strongly rugose-tuberculate.—Sierra Nevada foothills from Butte Co. to Tehama Co. (Red Bluff, ne. of, *Jepson* 15,279a). July-Sept.

Var. **rattanii** Jepson comb. n. Herbage minutely pubescent; glands sometimes with a narrow white appendage; capsule pubescent.—Sandy or gravelly soil, dry creek beds, 800 to 1500 feet, Glenn and Colusa Cos.; Stony Creek, w. Glenn Co., *Rattan;* Newville (e. of), Glenn Co., *Heller* 11,555.

Refs.—EUPHORBIA OCELLATA D. & H. Pac. R. Rep. 5:15, t. 18 (1855), type loc. Posé Creek, Kern Co., *Heermann;* Jepson, Fl. W. Mid. Cal. 262 (1901), ed. 2, 247 (1911), Man. 600 (1925). *Chamaesyce ocellata* Millsp. Field Mus. Publ. Bot. 2:410 (1916). Var. ARENICOLA Jepson, Man. 600 (1925). *Euphorbia arenicola* Parish, Erythea 7:93 (1899), type loc. Camp Cady, Mohave Desert, *Parish* 1370. *Chamaesyce arenicola* Millsp. l.c. 408. Var. SULFUREA Jepson. *Chamaesyce sulfurea* Millsp. l.c. 405, type loc. hills near Big Chico Creek, Butte Co., *Heller* 11,140. Var. RATTANII Jepson. *Euphorbia rattanii* Wats. Proc. Am. Acad. 20:372 (1885), type loc. Stony Creek, nw. Glenn Co. (formerly part of Colusa Co.), *Rattan*. *Chamaesyce rattanii* Millsp. l.c. 411.

9. **E. eremica** Jepson. DESERT SPURGE. Stems few or several from the base, prostrate, slightly glandular, 4 to 8 inches long; herbage yellowish-green, glabrous; leaf-blades oblong-elliptic, obtuse, entire, 2 to 5 lines long; stipules fimbriate; involucres turbinate-cylindric, the glands saucer-shaped with the margin produced outwards into 2 acute ciliate or fimbriate lobes or horns; capsules obtusely angled, 1½ lines long; seeds ellipsoid, round on the back, flattish on the face, very smooth, clay-white or ashy-pink, 1½ lines long.

Sandy plains, 200 feet: Conchilla Desert, Riverside Co. May.

Ref.—EUPHORBIA EREMICA Jepson, Man. 600 (1925), type loc. Conchilla Desert, *Jepson* 6047.

10. **E. albomarginata** T. & G. RATTLESNAKE WEED. Stems numerous from a branched often woody root-crown, slender, prostrate or decumbent, 2 to 12 inches long; herbage glabrous; leaf-blades nearly orbicular to round-ovate, 2 to 4 lines long, margined with a thin whitish extremely narrow edge, often retuse; stipules united into a conspicuous membranous white triangular scale, entire or slightly lacerate; involucres mostly solitary, nearly 1 line long; glands 4, orange or brownish, the appendages conspicuous, white or rose-color, entire or undulate, ½ line long; capsules smooth, nearly 1 line long, the lobes angled on the back; seeds oblong, 4-angled, whitish, minutely embossed, ¾ line long.

Plains, mesas and rocky slopes, 400 to 7500 feet: coastal Southern California; Colorado and Mohave deserts; Kern and Inyo Cos. East to Texas, south to Mexico. Mar.-Oct.

Locs.—Bishop, *Almeda Nordyke;* Emigrant Sprs., Panamint Range, *Parish* 10,086; Hanaupah Cañon, Panamint Range, *Jepson* 7000; Bakersfield, Kern Co., *Davy* 1937; Coolgardie, n. of Daggett, *Jepson* 4824; Kessler Peak, Ivanpah Mts., e. Mohave Desert, *Jepson* 15,829; Palo Verde Valley, *Jepson* 5261; Rock Creek Cañon, San Gabriel Mts., *Peirson* 459; Ft. Yuma, *Jepson* 11,734; Inglewood, Los Angeles Co., *Abrams* 2480; Riverside, *Jepson* 1209; San Jacinto Valley, *Parish;* Box Cañon, Blair Valley, e. San Diego Co., *Jepson* 8709.

Refs.—EUPHORBIA ALBOMARGINATA T. & G. Pac. R. Rep. 2:174 (1855), type loc. "headwaters of the Colorado," that is, western Texas, *Diffenderfer;* Jepson, Man. 600 (1925). *Chamaesyce albomarginata* Small, Fl. Se. U. S. 710, 1333 (1903).

EUPHORBIA SERPENS H. B. K. Nov. Gen. et Sp. 2:52 (1817), type loc. "in umbrosis Cumanae prope Bordones et Punta Araya", Venezuela (cf. Sandwith, Kew Bull. 1925:295–310). *Chamaesyce serpens* Small, Fl. Se. U. S. 709 (1903). Creep Spurge. Differing from E. albomarginata mainly by the annual habit. Durmid, Salton Sink, acc. *Parish* (Carnegie Inst. Wash. Publ. 193: 110).

11. **E. polycarpa** Benth. SENTENAC SPURGE. Stems numerous, ascending or prostrate from a thick or branched root-crown, markedly leafy with minute leaves, 2 to 11 inches long; herbage glabrous or somewhat finely pubescent; leaf-blades round-ovate or ovate to oblong, slightly cordate at base or obtuse, obtuse or acutish at apex, ½ to 2½ lines long; stipules minute, lanceolate to short-triangular, ciliate; involucres commonly solitary in the axils, turbinate-campanulate, ½ to ¾ line long; glands transversely oblong, red-purple (sometimes yellow), the appendages varying from conspicuous (broad, white or rose-color and somewhat crenulate) to none; capsules ¾ line long, puberulent, the lobes angled; seeds oblong, 4-angled, salmon-color or ashy, ½ line long.

Dry hillsides or washes, –200 to 5000 feet: Inyo Co. to San Diego Co. East to Arizona and Nevada, south to Lower California. Mar.-Dec.

Locs.—Pinto basin, Virginia Dale region, *Jepson* 12,628; Chuckwalla wash, e. Riverside Co., *Hall* 5900; Borrego Valley, *J. T. Howell* 3209; Wagon Wash near Sentenac Cañon, e. San Diego Co., *Jepson* 12,475; La Jolla, *Newlon* 312; San Diego, *Harriet Kelley.* The above spms. are glabrous; the following with at least the petioles short-hirtellous are intermediate toward the variety hirtella: Furnace Creek, Death Valley, *Parish* 10,038; Palm Cañon of San Jacinto, *Jepson* 1374.

Var. **hirtella** Boiss. Herbage minutely hirsute throughout.—Sandy washes, 500 to 2600 feet: Colorado and Mohave deserts. East to western Nevada. Apr.-Oct.

Locs.—Colorado Desert: Dixieland, *Parish* 8308; Devils Cañon, Santa Rosa Mts., *Clary;* Palm Sprs. of San Jacinto, *Parish* 4143; Conchilla Desert, *Jepson* 6054; Cottonwood Spr., n. of Mecca, *Parish* 10,830; Twenty-nine Palms, *Jepson* 5964. Mohave Desert: Amargo, *Jepson* 15,789; Soda Lake (near Baker), *Mary Beal.*

Var. **parishii** Jepson comb. n. Gland-appendages none or extremely narrow.—Inyo Co.: Emigrant Sprs., *Parish* 10,190; Furnace Creek ranch, Death Valley, *Jepson* 6879.

Refs.—EUPHORBIA POLYCARPA Benth. Bot. Sulph. 50 (1844), type loc. Bay of Magdalena, L. Cal., *Hinds;* Jepson, Man. 600, fig. 593 (1925). *Chamaesyce polycarpa* Millsp. Field Mus. Publ. Bot. 2:411 (1916). Var. HIRTELLA Boiss.; DC. Prod. 15^2:44 (1862), type from Cal., *Emory. E. polycarpa* Jepson, Man. 600 (1925) in part. *Chamaesyce polycarpa* var. *hirtella* Millsp.; Parish, Carnegie Inst. Wash. Publ. 193:110 (1914). *C. tonsita* Millsp. Field Mus. Publ. Bot. 2:412 (1916). Var. PARISHII Jepson. *E. parishii* Greene, Bull. Cal. Acad. 2:56 (1886), type loc. "Warm Sprs., Mohave Desert," *Parish* 1384 (gland-appendages absent). *Chamaesyce parishii* Millsp.; Parish, Carnegie Inst. Wash. Publ. 193:110 (1914). *E. pseudoserpyllifolia* Millsp. Pitt. 2:87 (1890), type loc. valley of the Gila River, Ariz., *P. F. Mohr* (at least as to California spms. so named).

12. **E. melanadenia** Torr. SQUAW SPURGE. Stems procumbent to erect, diffusely branched, 3 to 12 inches long; herbage canescent, often purple-tinged; stipules minute, subulate, ciliate; leaves numerous, crowded, the blades roundish-oval or ovate, oblique at the base, entire, 1 to 3 lines long; petioles ¼ to ½ line long; involucres solitary in the axils, turbinate-campanulate, ½ line long; glands purplish-black (or brownish), elliptical, shallowly cupped; appendages usually broad and conspicuous, white to rose-pink, crenulate (rarely narrow or absent), often 1 line wide; capsule 1 line long, the lobes carinate; seeds reddish-brown, quadrate-oblong, ⅔ line long, the facets slightly wrinkled.

Dry valley flats and open hillsides, 745 to 4000 feet: Los Angeles Co. to San Diego Co. East to Arizona and western Nevada. Apr.-Dec.

Locs.—Santa Monica, *Brewer* 54; Arroyo Seco, San Gabriel Mts., *Peirson* 310; Montezuma Valley near Warner Hot Sprs., *Jaeger;* San Felipe, *Jepson* 12,444; Box Cañon, Blair Valley, e. San Diego Co., *Jepson* 8704; Mountain Sprs., e. San Diego Co., *Newlon* 368.

Refs.—EUPHORBIA MELANADENIA Torr. Pac. R. Rep. 4:135 (1857), type loc. San Gabriel, *Bigelow. Chamaesyce melanadenia* Millsp. Field Mus. Publ. Bot. 2:410 (1916). *Euphorbia polycarpa* var. *vestita* Wats. Bot. Cal. 2:73 (1880); Jepson, Man. 601 (1925). *E. cinerascens* var. *appendicula* Torr. Bot. Mex. Bound. 2:186 (1859), type loc. San Felipe, *LeConte. Chamaesyce aureola* Millsp. l.c. 406, type loc. Azusa, Los Angeles Co., *H. H. Smith* 4933.

EUPHORBIA CINERASCENS Engelm. Bot. Mex. Bound. 186 (1859), type loc. "on the Rio Grande", *Wright. Chamaesyce cinerascens* Small, Fl. Se. U. S. 710 (1903). Ash Spurge. Similar in appearance to E. melanadenia but differing in the annual or biennial habit. Figtree John Spr., w. Colorado Desert, acc. *Parish* (Carnegie Inst. Wash. Publ. 193:110).

13. **E. vallis-mortae** J. T. Howell. INDIAN SPURGE. Stems from a thickened root, indurated below, much branched above, 3 to 6 inches high; upper stems and herbage canescently hirsutulous throughout, the hairs spreading; stipules minute, subulate, ciliate; petioles scarcely ½ line long; leaf-blades thick, entire, broadly ovate to suborbicular, oblique at the base, 2½ to 4 lines long; involucres solitary in the axils, campanulate, ½ line long on peduncles 1 line long or less; glands large, greenish or brownish, oval (scutelliform); appendages white, broad, flabelliform, crenulate or undulate, the margins ciliolate; capsule (obpyriform) 1 line long, the lobes scarcely carinate; seeds ashy-pink, quadrate-ovate, ¾ line long, the facets smooth or nearly so.

Dry sand, 2000 to 3600 feet: Owens Valley and Indian Wells Valley. June.

Locs.—Owens Lake, Inyo Co., *Hall & Chandler* 7323; Red Rock Cañon, Kern Co., *Peirson* 7334; Indian Wells, Kern Co., *Purpus* 5473.

Refs.—EUPHORBIA VALLIS-MORTAE J. T. Howell, Madroño 2:19 (1931). *Chamaesyce vallis-mortae* Millsp. Field Mus. Publ. Bot. 2:403 (1916), type *Coville & Funston* 1008, type loc. given as "Death Valley, between Mohave and Keeler", *Coville & Funston*, but no. 1008 was actually collected "a few kilometers north of Indian Wells" (Contrib. U. S. Nat. Herb. 4:256), which is in the lower Owens Valley and some 60 miles from Death Valley.

14. **E. misera** Benth. CLIFF SPURGE. Much branched straggling shrub 2 to 3 feet high; herbage minutely puberulent or glabrate; leaves mostly fascicled, the blades round-obovate, obtuse or retuse, 2 to 5 lines long, exceeding the petioles; stipules inconspicuous, erose, fugacious; involucres solitary, terminal on the short branchlets of the season, hemispheric, 1 line long, their lobes short, inflexed; glands purple, with a white crenulate appendage; capsules minutely papillose and short-hispid, 2 to 2½ lines long, with rounded lobes; seeds round-ovate, reticulate-wrinkled or slightly pitted, 1⅓ lines long.

Rocky slopes, usually along the coast, and headlands over the sea: Santa Catalina Isl.; Orange, Riverside and San Diego Cos. South to Lower California. Dec.-Aug.

Locs.—Santa Catalina Isl. (Field Mus. Publ. Bot. 5:163); Corona del Mar, Orange Co., *L. M. Booth* 1300; Arch Beach, Orange Co. (Bull. S. Cal. Acad. 22:8); Palm Sprs. of San Jacinto, *Jaeger;* San Diego, *Cleveland.*

Refs.—EUPHORBIA MISERA Benth. Bot. Sulph. 51 (1844), type loc. San Diego and San Quentin, *Hinds;* Jepson, Man. 601 (1925). *Trichosterigma miserum* Kl. & Gke. Monatsber. Akad. Berl. 1859:248 (1860). *Euphorbia benedicta* Greene, Pitt. 1:263 (1889), type loc. San Benito Isl., L. Cal., *Pond.*

15. **E. eriantha** Benth. BEETLE SPURGE. Stem branching at or near the base, ½ to 1½ feet high, the branches slender, 7 to 18 inches high; herbage glabrous or finely puberulent above; leaves distant, the blades narrowly linear, attenuate to a short petiole, 1 to 2¼ inches long, the uppermost forming a whorl subtending the flower-cluster and many times exceeding the flowers; involucres in close clusters of 1 to 4 at the end of each branch, hoary-pubescent, campanulate, their lobes incurved, fimbriate with densely pubescent teeth; glands thin, the broad appendage fimbriate; styles undivided; capsules obtusely lobed, finely pubescent, 2 to 2½ lines long; seeds quadrate-oblong, 1½ lines long, brown, with low warty ridges; caruncle conspicuous, stipitate, lunate.

Cañons and mesas, among rocks, 500 to 3000 feet: Colorado Desert. South to Lower California. Apr.

Locs.—Chuckwalla bench, e. Riverside Co., *Hall* 5876; Eagle Mts., Riverside Co., *Munz & Keck* 4820; Andreas Cañon, Palm Sprs. of San Jacinto, *Parish* 1226; Devils Cañon, Santa Rosa Mts., *Clary;* Yaqui Well, e. San Diego Co., *Jepson* 12,535.

Refs.—EUPHORBIA ERIANTHA Benth. Bot. Sulph. 51 (1844), type loc. Bay of Magdalena, L. Cal., *Hinds;* Jepson, Man. 601 (1925). *Poinsettia eriantha* Rose & Standl. Contrib. U. S. Nat. Herb. 16:13 (1912).

16. **E. dictyosperma** F. & M. WART SPURGE. Stems erect, 5 to 15 inches high, simple or branching from the base, dichotomously branched above; herbage glabrous; blades of the lower leaves oblong- or obovate-spatulate, serrulate, often retuse, ½ to 1¼ inches long, sessile or the lowermost shortly petioled; upper and floral leaves opposite, the blades round-ovate to oblong, sessile, 3 to 6 lines long; inflorescence umbelliform, the rays 2 or 3 times forked; involucre and glands small; glands not horned; capsules with warty lobes, 1 to 1¼ lines long; seeds brown to blackish, finely reticulate, ellipsoid, ¾ to 1 line long.

Open slopes or flats, adobe, sandy or rocky soil, 25 to 1500 (or 4000) feet: throughout cismontane California but infrequent. North to Washington, east to the Rocky Mts., south to Mexico. Mar.-May.

Locs.—Bridgeville, Humboldt Co., *Tracy* 7455; Trinity River near the South Fork, *Tracy* 7431; Little Hot Sprs., Modoc Co., *M. S. Baker;* Potter Valley, Mendocino Co., *Purpus;* College City, *Alice King;* Denverton, Solano Co., *Jepson* 13,922; Brentwood, *Chesnut & Drew;* Oakland Hills, *Jepson* 10,394; Alameda, *Jepson* 13,923; Santa Lucia Mts., San Luis Obispo Co., *Summers;* Los Gatos Creek, w. Fresno Co., *Jepson* 12,186; Amador Co. (Hansen, Fl. Sequoia Reg. 3); Santa Catalina Isl., *K. Brandegee;* Santa Ana Mts., *Alice King;* San Diego, *Hall* 3915.

Refs.—EUPHORBIA DICTYOSPERMA F. & M. Ind. Sem. Hort. Petrop. 2:37 (1835), type from North America; Jepson, Fl. W. Mid. Cal. 263 (1901), ed. 2, 247 (1911), Man. 601, fig. 594 (1925). *Tithymalus dictyospermus* Hel. Muhl. 1:56 (1904).

17. **E. crenulata** Engelm. CHINESE CAPS. Stems several from the base, erect, rarely decumbent at base, 6 to 16 inches high, 2 or 3 times dichotomous above; herbage glabrous; leaf-blades obovate to spatulate, obtuse, sometimes mucronate, entire, sessile or the lower shortly petioled, 4 to 15 lines long, the floral leaves opposite or ternate, their blades deltoid or broadly rhombic-ovate, sessile, sometimes cordate at base or connate, apiculate, 3 to 5 lines long; involucre turbinate, its transversely oblong lobes denticulate; glands large, crescent-shaped, the slender horns entire or cleft; capsules smooth, 1½ lines broad; seeds vermicular-rugulose or nearly smooth, ash-color, 1 to 1½ lines long, with a prominent caruncle.

Sandy hills and brushy slopes, 10 to 4500 feet: common throughout cismontane California. East to Arizona and Colorado, north to Oregon. Mar.-Aug.

Locs.—Coast Ranges: Cherry Creek, Siskiyou Co., *Butler* 909; betw. Shasta Retreat and Shasta Sprs., *Heller* 7981; Bluff Creek, n. Humboldt. Co., *Chandler* 1457; Kneeland Prairie, Humboldt Co., *Tracy* 3882; Burnt Ranch, Trinity Co., *Tracy* 6404; Gravelly Valley, n. Lake Co., *Jepson* 13,922a; Kelseyville, Lake Co., *Irwin* 101; Mt. St. Helena, *Jepson* 10,369; Calistoga, se. of, *Jepson;* Conn Valley, Napa Range, *Jepson* 6251; Sonoma Cañon, Kenwood, *Jepson* 10,012; Mt. Davidson, San Francisco, *Jepson* 10,585; Lake Merced, San Francisco, *H. A. Walker* 1127; Pacific Grove, *Heller* 6486. Sierra Nevada: Forestdale, sw. Modoc Co., *M. S. Baker;* Morley sta., Shasta Co., *Baker & Nutting;* Pine Creek, Lassen Co., *Baker & Nutting;* Forest Hill, s. Placer Co., *L. S. Smith* 1621; Elsie Creek, Amador Co., *Hansen* 1094; Chowchilla School, Mariposa Co., *Jepson* 12,798; betw. Dunlap and Pinehurst, Fresno Co., *Newlon* 160. S. Cal.: Santa Barbara, *T. Brandegee;* Glendora, Los Angeles Co., *Braunton* 301; Mesa Grande, San Diego Co., *E. Ferguson* 81. The following stout apparently perennial spms. may represent var. franciscana Norton: San Francisco, *K. Brandegee;* near Marine Hospital, San Francisco Co., *Heller* 6625.

Refs.—EUPHORBIA CRENULATA Engelm. Bot. Mex. Bound. 192 (1859), type loc. Monterey, *Hartweg* 1950 (cf. Bentham, Pl. Hartweg. 334); Jepson, Man. 601, fig. 595 (1925). *E. leptocera* Engelm.; Torr. Pac. R. Rep. 4:135 (1857), "Grass Valley", *Bigelow* (nomen nudum); Jepson, Fl. W. Mid. Cal. 263 (1901), ed. 2, 247 (1911). *E. leptocera* var. *crenulata* Engelm.; Boiss. in DC. Prod. 15^2:143 (1862). *Tithymalus crenulatus* Hel. Muhl. 1:55 (1904). *T. leptocerus* Arthur, Torreya 22:30 (1922). *E. crenulata* var. *franciscana* Norton, Rep. Mo. Bot. Gard. 11:122 (1899), type loc. San Francisco, *Bolander* 20. *Tithymalus franciscanus* Hel. Muhl. l.c. 56. *E. nortoniana* Nels. Bot. Gaz. 47:437 (1909).

EUPHORBIA HELIOSCOPIA L. Sp. Pl. 459 (1753), type European. *Tithymalus helioscopius* Hill, Hort. Kew. 172^3 (1768). Sun Spurge. Annual; stems stout, erect or ascending; herbage glabrous or nearly so; leaf-blades spatulate-obovate, serrulate; involucral glands yellowish, entire, without appendages; capsules smooth; seeds ovoid-globose, sharply reticulate, yellowish-brown to blackish, caruneulate.—European weed widely distributed in eastern United States and occurring as a pest in fields at Elk, Mendocino Co. (acc. J. T. Howell, Madroño 2:20).

EUPHORBIA EXIGUA L. Sp. Pl. 456 (1753), type European. *Tithymalus exiguus* Hill, Hort. Kew. 172^3 (1768). Dwarf Spurge. Low annual; branches erect or ascending; leaf-blades linear-oblong or lanceolate; involucres in terminal cymes; glands transversely oval, 2-horned; capsules smooth; seeds blackish, quadrangular-ovoid, tuberculate, the prominences whitish.—Santa Clara Co. (acc. Norton, Rep. Mo. Bot. Gard. 11:112).

EUPHORBIA VIRGATA Waldst. & Kit. Pl. Rar. Hung. 2:176, t. 162 (1805). *E. esula* of Am. manuals. Summer Spurge. Stems erect, several from a branched root-crown, 1¼ to 1½ feet high; herbage glabrous; leaves linear, ¾ to 1¼ inches long, those of the inflorescence orbicular-ovate, abruptly short-acute, 4 to 5 lines long, broader than long; glands yellowish, somewhat crescent-shaped or 2-horned.—Native of Europe, introduced into cultivated fields: Scott Valley, Siskiyou Co., *W. T. Davidson*, about 1917; Adin, Modoc Co., *F. C. Chace*, 1916.

18. **E. peplus** L. PETTY SPURGE. Stems simple or usually branched from the base, 4 to 10 inches high, umbellate above, the branches of the umbel dichotomous; herbage glabrous; leaf-blades obovate or rotund, obtuse or retuse, 5 to 9 lines long, the slender petiole 2½ lines long; leaves of the umbel oblong or ovate, sessile; involucre about ½ line long, the triangular-ovate lobes ciliate with short thick hairs; glands with long spreading horns; capsules depressed-globose, the lobes with 2 thin and very narrow longitudinal crests on the back; seeds oblong, ashy, ¾ line long, with about 4 to 6 rows of large dark pits; caruncle white, conical.

Garden weed introduced from Europe: mostly coastal towns and settlements. Apr.-Aug.

Locs.—Eureka, *Tracy* 7473; Stewarts Pt., Sonoma Co., *M. S. Baker* 17; Berkeley, *Michener & Bioletti;* Monterey, *Jepson* 9752; San Bernardino, *Parish* 11,731.

Refs.—EUPHORBIA PEPLUS L. Sp. Pl. 456 (1753), type European; Jepson, Fl. W. Mid. Cal. 263 (1901), ed. 2, 247 (1911), Man. 602 (1925). *Tithymalus peplus* Hill, Hort. Kew. 172^3 (1768).

19. **E. palmeri** Engelm. WOOD SPURGE. Stems several from the woody root-crown, erect, $\frac{1}{3}$ to $1\frac{1}{2}$ feet high, simple but umbelliferous above with 3 or 5 rays; herbage glabrous and glaucous; leaf-blades obovate to oblanceolate, obtuse (or acute), thick, shortly petiolate, 4 to 12 lines long, those of the inflorescence very broadly rhombic-ovate to subreniform, very obtuse, mostly apiculate; involucres 1 line long, their lobes rounded, entire, ciliate; glands shortly stipitate, crenate, somewhat 2-horned; capsules ovate, 2 lines long; seeds ovoid, dark to whitish, shallowly rugose, $1\frac{1}{3}$ lines long.

Wooded slopes in sandy soil, 4000 to 9100 feet: Southern California mountains from northern Ventura Co. to San Diego Co. South to Lower California. May-June.

Locs.—North Creek, Mt. Pinos, *Hall* 6434; Big Pines, San Gabriel Mts., *Peirson* 3184; Fish Creek, San Bernardino Mts., *J. Grinnell;* Strawberry Valley, San Jacinto Mts., *Jepson* 1307; Saunders Mdw., San Jacinto Mts., *C. V. Meyer* 200; Julian, San Diego Co., *T. Brandegee;* Laguna Mts., San Diego Co., *Cleveland* 329.

Refs.—EUPHORBIA PALMERI Engelm.; Wats. Bot. Cal. 2:75 (1880), type loc. Talley's Ranch, Cuyamaca Mts., *Palmer* 450; Jepson, Man. 602 (1925). *Tithymalus palmeri* Abrams, Fl. Los Ang. 216 (1917).

20. **E. schizoloba** Engelm. MOHAVE SPURGE. Stems erect or decumbent at base, several from the woody root-crown, branched at or near the base, the branches 6 to 16 inches high, at summit once to thrice dichotomous; herbage glabrous or slightly puberulent, somewhat glaucous; leaf-blades ovate to obovate, cuspidate, 3 to 6 lines long, narrowed to a short petiole or subsessile, the floral ternate, round-ovate, sessile; involucre 1 line long, its lobes truncate, notched; glands stipitate, broad, irregularly toothed; styles united at base; capsules glabrous, smooth; seeds oblong-ovoid, very shallowly rugulose, $1\frac{1}{3}$ lines long.

Cañons, sandy washes or open desert slopes, 3000 to 4000 feet: eastern Mohave Desert, north into Inyo Co. East to Nevada and Arizona. Mar.-May.

Locs.—Sheep Hole Mts., e. Mohave Desert, *Jaeger;* Bonanza King Mine, Providence Mts., *Munz* 4109; Hanaupah Cañon, Panamint Range, *Jepson* 6967. The following spm. with less lacerate glands is apparently a form of this species, although from a much lower altitude (–200 feet): Figtree John Spr., w. Riverside Co., *Munz & Harwood* 3556.

Refs.—EUPHORBIA SCHIZOLOBA Engelm. Proc. Am. Acad. 5:173 (1861), type loc. e. of the lower Colorado River, *Newberry;* Jepson, Man. 602 (1925). *E. incisa* Engelm. Ives Rep. 4:27 (1860), type loc. Long Valley, Ariz., *Newberry. Tithymalus schizoloba* Norton, Contrib. U. S. Nat. Herb. 25:343 (1925).

EUPHORBIA LATHYRUS L. Sp. Pl. 457 (1753), type European; Jepson, Fl. W. Mid. Cal. 263 (1901), ed. 2, 247 (1911), Man. 601 (1925). Caper Spurge. Stout annual or biennial 1 to 3 feet high, very smooth and glaucous; stem-leaves in 4 vertical ranks, the blades linear or narrowly oblong, thick, 2 to 4 inches long, the floral oblong-ovate and cordate; umbels of 3 or 4 rays, once or twice forked; glands of the involucre crescent-shaped, the horns usually recurved; capsule wrinkled when dry, 3 to 5 lines high, 6 to 7 lines broad.—Mediterranean species, occasionally adventive about settlements or occurring in cultivated fields: Myers Ranch, South Fork Eel River, Humboldt Co., *Tracy* 5110; West Berkeley, *H. A. Walker;* Skylonda, San Mateo Co., *J. T. Daly* 390; Jolon, Monterey Co., *T. Brandegee;* Morro, San Luis Obispo Co., *Condit;* Lompoc, *Condit;* Seven Oaks, San Antonio Cañon, San Gabriel Mts., *Johnston* 1747. It is often planted in California gardens under the name Gopher Plant with the belief that it is a bane to gophers.

CALLITRICHACEAE. WATER STARWORT FAMILY

Herbs growing in shallow water or in the mud of drying vernal pools. Leaves opposite, entire, exstipulate, often crowded and forming a rosette at the ends of the branches; floating-type leaves 3-nerved, aquatic-type 1-nerved, usually covered with dots or stellate pits. Flowers monoecious, axillary and solitary, or 2 or 3 together in one axil, without calyx or corolla but often with two membranous bracts which may become inflated. Staminate flower consisting of 1 terminal stamen. Pistillate flower consisting of a 4-celled ovary with 2 filiform stigmas. Fruit 4-lobed, splitting at maturity into as many nutlets; nutlets (in ours) flattened; seeds enclosed in a hyaline envelope.—Genus 1, species 2 to 25, as variously estimated; all continents.

Note on the inflorescence.—The flowers are always axillary. In California material (both in the open and in cultures) only one pistillate flower has been found in an axil. Staminate flowers have not been seen in submerged plants in cultures, yet these plants produce seed. The distribution of flowers is as follows: (a) an axil may be bisexual, that is with one pistillate flower and 1, 2 or 3 staminate flowers; (b) an axil may be unisexual with only one pistillate flower; (c) an axil may be unisexual with 1, 2, or 3 staminate flowers (H. L. Mason).

Bibliog.—Clarke, C. B., On the structure and affinities * * * of Callitrichaceae (Trans. Linn. Soc. 22:411–412,—1859). Hegelmaier, F., Monographie der Gattung Callitriche, 1–64, t. 1–4 (1864); Beitrag zur Kenntniss der Wassersterne (Verhand. Bot. Ver. Brandenb. 10:100–121,—1868). Schenck, H., Vergleichende Anatomie der submersen Gewächse (Biblio. Bot. 1:1–67, t. 1–10,—1886). Schrenk, J., Notes on the inflorescence of Callitriche (Bot. Gaz. 13:296–299,—1888). Morong, Thos., [Notes on N. Am. Callitriches], (Bull. Torr. Club 18:232–239,—1891). Fenley, Kittie L., The Californian species of Callitriche (1932), ms.

1. CALLITRICHE L. WATER STARWORT

The only genus. (Greek kallos, beautiful, and trichos, a hair, on account of the slender stems.)

Note on variation and habitat.—The question as to what extent the structures of species in this genus are affected by the environment is one which must eventually be answered by cultural studies. Through cultures made by Kittie L. Fenley at the University of California in 1931 and 1932, it was shown that Callitriche marginata, C. palustris var. bolanderi, and C. autumnalis, grown under the same conditions, retain their distinctive characteristics. C. autumnalis, known only as an entirely submersed species, did not grow when emersed, until a cover placed upon the container brought the atmosphere nearly to a saturated condition. Callitriche marginata formed the terminal rosette of floating-type leaves even when entirely submersed. Callitriche palustris seemed to be adversely affected by some unknown factor and produced smaller leaves than naturally. Callitriche palustris var. bolanderi produced the characteristic long linear leaves, and as the water receded floating-type leaves appeared at nodes once submersed. The fruits throughout the genus tend to become hypogaeous when in contact with soil; this condition is, therefore, of no value as a segregating character for the species.

Fruit peduncled; plants terrestrial or amphibious; bracts present or absent..........1. *C. marginata.*
Fruit sessile or subsessile; plants mainly aquatic (sometimes terrestrial or amphibious).
  Leaves floating or submersed; emersed leaves obovate or spatulate.
    Stems usually stout, leafy..........2. *C. palustris.*
    Stems filiform, naked below; leaves mostly terminal..........3. *C. stenocarpa.*
  Leaves linear, all submersed..........4. *C. autumnalis.*

1. **C. marginata** Torr. WALLOW STARWORT. Plants rooting from the nodes, mainly terrestrial, forming dense prostrate mats, or sometimes partly submersed; stems 2 to 6 inches long; leaf-blades of terrestrial plants or blades of the emersed floating leaves spatulate to oblanceolate, 3-nerved, 1 to 3½ lines long; blades of submersed leaves linear-acuminate or linear to oblanceolate or spatulate, the apices obtuse or rounded, 4 to 7 lines long; bracts usually none, if present minute, filiform crescent-shaped (⅛ to ⅜ line long); peduncles stout, spreading, 1 to 3 (or 5) lines long, often deflexed and hypogaeous; fruits dark gray, slightly broader than long, notched at base and apex, ⅓ to ½ line long, the lobes conspicuously wing-margined, the proximate diverging about ⅛ line; styles persistent, ½ to 1 line long, becoming brown and filiform (almost capillary), reflexed over the fruit, and slightly exceeding it.

Wet mud or shallow fresh water pools, 100 to 1250 feet: Coast Ranges from Humboldt Co. to Monterey Co.; central Great Valley; San Bernardino Valley. East to Arizona. Chile. Mar.-June.

Locs.—Coast Ranges: Eureka, *Tracy* 2975; Miranda, Humboldt Co., *Tracy* 6948; Calistoga, *Jepson* 13,819; Yountville, Napa Valley, *Jepson* 13,820; Shellville, Sonoma Co., *Fenley* 588; betw. Bolinas and Olema, Marin Co., *Mason* 6805 (styles deciduous, representing the phase C. nuttallii Torr.); Richmond, Contra Costa Co., *Fenley* 709; Cerrito Creek, Berkeley Hills, *Tracy* 2068; Puerto Cañon, w. Stanislaus Co., *Brewer* 1256 (C. nuttallii Torr.); Bloomquists Mills, San Mateo Co., *Fenley* 673, *Mason* 3697 (C. nuttallii Torr.); Tres Pinos, San Benito Co., *Jepson* 16,124; Santa Lucia ranger sta., Santa Lucia Mts., *Fenley* 651, 659. Great Valley: Vacaville, *Jepson* 1195; Waverley, San Joaquin Co., *Sanford* 360; Califa, Madera Co., *Jepson* 15,165. San Bernardino Valley: Red Hill near Upland, *Parish* 11,153. The phase known as C. nuttallii Torr. was segregated mainly upon hypogaeous fruits. Its infrequent occurrence and close similarity to C. marginata suggest that it is a habitat form of the same plant which appears later in the season when the pools are drying up.

Var. **longipedunculata** Jepson. Plants usually aquatic; stems filiform, 3 to 12 (or rarely 24) inches long; herbage with conspicuous stellate pits; blades of the aquatic and emersed leaves mostly similar (linear and intermediate leaves few), spatulate to round-obovate, 3-nerved, sometimes slightly emarginate, ½ to 2½ lines long; petioles ½ to 1½ lines long; bracts present, usually large and conspicuous, obovate (rarely filiform), ¼ to ¾ line long; stamens in the axils 2, 1 or none, the filaments ½ to 1 line long; fruit narrowly winged, at first sessile, later developing a peduncle 2 to 12 (or 24) lines long.—Fresh or stagnant pools (rarely terrestrial), 10 to 650 feet: Sonoma Co. to Contra Costa Co.; central Great Valley; Sierra Nevada foothills from Calaveras Co. to Merced Co.; western San Diego Co. Feb.-Apr.

Note on variation and habitat.—The variety longipedunculata is distinguished from Callitriche marginata mainly by the presence of bracts and by longer peduncles. Since the bracts vary from conspicuous to minute in the same individual, the short additional step of complete absence is to be expected. The peduncles of this variety range in length beyond the upper limit for C. marginata but in most specimens examined fall within that limit. There seems to be no geographic segregation, although there may be a difference in habitat; the variety longipedunculata, according to K. Fenley, is more aquatic or amphibious than the species and often inhabits stagnant pools.

Locs.—Central Coast Ranges: Santa Rosa, *Fenley* 594; Livermore, *Mason* 6807, 6808; Briones road, Contra Costa Co., *Mason* 715; Walnut Creek, Contra Costa Co., *Fenley* 708. Great Valley: Redding, *Blankinship;* Dozier sta., Solano Co., *Jepson* 12,398; Stockton, *Mason* C6; Oakdale, Stanislaus Co., *Hormay* 702; Wide-awake Ranch, Madera Co., *Jepson* 15,155. Sierra Nevada foothills: Valley Sprs., Calaveras Co., *Mason* 5198; Rawhide, Tuolumne Co., *Hormay* 711; Snelling road, Merced Co., *Hormay* 706a, 706b. San Diego Co.: Camp Kearney, *Harold Parks* 366.

Refs.—CALLITRICHE MARGINATA Torr. Pac. R. Rep. 4:135 (1857), type loc. Mark West Creek, *Bigelow;* Jepson, Fl. W. Mid. Cal. 264 (1901), ed. 2, 248 (1911), Man. 602 (1925). *C. pedunculosa* Nutt. Trans. Am. Phil. Soc. n. ser. 5:140 (1837), type loc. "from Arkansas to the Pottoe etc.," *Nuttall;* not C. pedunculosa Arnott, acc. Morong, Bull. Torr. Club 18:235 (presumably a prior homonym), nor C. pedunculata DC. (1805). *C. nuttallii* Torr. Pac. R. Rep. 4:135 (1857). Var. LONGIPEDUNCULATA Jepson, Man. 603 (1925). *C. longipedunculata* Mor. Bull. Torr. Club 18:236 (1891), type loc. San Diego, *Orcutt.*

2. **C. palustris** L. WATER FENNEL. Aquatic or amphibious plants; stems leafy, in terrestrial plants 2 to 6 inches long, in aquatic plants 6 to 18 inches long; floating, submersed and intermediate leaves all well-developed; blades of submersed leaves linear, sometimes notched at apex, 1-nerved, 3 to 8 (or 10) lines long; floating leaves sometimes forming a terminal rosette, their blades round-obovate to spatulate, 3-nerved, the apices entire or emarginate, 1½ to 3 (or 5) lines long; petioles of floating type of leaf winged, 1 to 2 lines long; stellate pits present; floral bracts ¼ to 1½ lines long; filaments 1 to 2½ (or 3½) lines long; styles more or less persistent, usually 1 to 2 lines long, 2 to 3 times as long as carpels; fruits roundish-elliptical in outline, flattened, slightly notched at apex, about ½ line long, the carpels narrowly margined, the approximate ones with a deep groove between.

Cool fresh pools or slow streamlets, or more rarely terrestrial at water's edge, 100 to 7400 feet: Coast Ranges from Siskiyou Co. to San Mateo Co.; Sierra Nevada from Lassen Co. to Fresno Co.; east side of Great Valley; San Bernardino Mts. East to the Atlantic, north to Canada. South America, Europe, Asia. Mar.-Aug. (fl. and fr.).

Locs.—Coast Ranges: Oro Fino Creek, Siskiyou Co., *Butler* 406; Bald Mt., Humboldt Co., *Tracy* 4950; Blue Lake, Humboldt Co., *Tracy* 2994; Ukiah, *Bolander* 4658; Calistoga, *Tracy* 1849; Howell Mt., Napa Co., *Tracy* 1614; Cazadero, Sonoma Co., *Davy* 1665; betw. Santa Rosa and Sonoma, *Fenley* 592; Olema, Marin Co., *Jepson* 13,822; Lake San Andreas, San Mateo Co., *Elmer* 4279. Sierra Nevada: Dixey Mts., Lassen Co., *Baker & Nutting;* Sierra Valley, *Lemmon;* Chico, *Kennedy;* Jackson, Amador Co., *Hansen;* Pinehurst, Fresno Co., *Ottley* 1419. Great Valley: Chico, *Kennedy;* Oakdale, Stanislaus Co., *Mason* 5170; Madera, *Mason* 5111. San Bernardino Mts.: Bluff Lake, *Munz* 10,483.

Var. **verna** Fenley comb. n. Terrestrial, not over 3 inches high; leaves of the floating type few, their blades smaller, 1 to 2 lines long; submersed leaves with blades 2 to 5 lines long; fruits broadly winged, oblong, ½ to ¾ line long; styles shorter than the fruit, always early fugacious; bracts small, inconspicuous, filiform; filaments ½ line long.—Butte Co. (Jonesville, *Copeland*); Humboldt Co. (*Tracy* 2995). East to the Atlantic. Europe.

Var. **bolanderi** Jepson comb. n. Plants entirely aquatic; leaves crowded on the stem, their blades mostly linear, subauriculate at base tapering to deeply notched apex, ½ to 2½ inches long; emersed leaves few, forming rosettes at surface of water, their blades roundish-obovate to spatulate, 1 to 5 lines long (or absent if plant is submersed); bracts small, linear or filiform.—Cold fresh water, 100 to 1250 feet: North Coast Ranges from Humboldt Co. to San Mateo Co.; Sierra Nevada foothills and bordering plains from Eldorado Co. to Mariposa Co.; San Diego Co. North to British Columbia. Mar.-May

Locs.—Alton, Humboldt Co., *Tracy* 4025; Boggs Lake, Mt. Hanna, Lake Co., *Blankinship;* Kenwood, Sonoma Co., *Bioletti;* Napa Valley, near Calistoga, *Jepson* 13,821; Santa Rosa (e. of), *Fenley* 564, 632; Mt. St. Helena, Napa Co., *Fenley* 554; Inverness Ridge, Marin Co., *Fenley* 646b; Spring Valley reservoir, San Mateo Co., *Fenley* 674. Sierra Nevada foothills and bordering plains from Eldorado Co. to Mariposa Co.: Pilot Hill, Eldorado Co., *K. Brandegee;* Clements, San Joaquin Co., *Mason* 5202; Montezuma, Tuolumne Co., *Hormay* 710; Oakdale (e. of), Stanislaus Co., *Mason* C5; Merced River, Mariposa Co., *Congdon.* San Diego Co.: Julian, *Parish* 1404.

Refs.—CALLITRICHE PALUSTRIS L. Sp. Pl. 969 (1753), type from Europe; Jepson, Fl. W. Mid. Cal. 264 (1901), ed. 2, 248 (1911), Man. 603 (1925). Var. VERNA Fenley. *C. verna* L. Fl. Suec. ed. 2, 2: n. 3 (1755), type European. *C. brevifolia* Pursh, Fl. 3 (1814), "New York to Virginia". Var. BOLANDERI Jepson. *C. bolanderi* Hegelm. Verhand. Bot. Ver. Brandenb. 10:116 (1868), type loc. Auburn, Placer Co., *Bolander* 4528.

3. **C. stenocarpa** Hegelm. SIERRA STARWORT. Plants entirely aquatic; stems filiform, 8 to 18 inches long, mostly naked, the 3 to 6 opposite pairs of leaves forming a terminal rosette; blades of floating leaves 3-nerved with rounded apices, spatulate to round-obovate, 2 to 5 (or 7) lines long; petioles distinctly marked with stellate pits, 1 to 3½ lines long; blades of submersed leaves linear, few or absent, 1-nerved, sessile to subauriculate, 1 to 4 lines long, slightly emarginate; bracts conspicuous, obovate when inflated, absent in old flowers, ¼ to ¾ line long; stamens present in nearly every fruiting axil; filaments ½ to 1½ lines long; styles deciduous or persistent, filiform, ¼ to ½ line long; fruits subquadrate, flattened, usually sessile (rarely with peduncles 2 lines long) sharply margined or broadly winged, deeply notched at apex, ½ to ¾ line long.

Clear cold pools, 500 to 6000 feet: high Sierra Nevada in Nevada Co.; Sierra Nevada foothills and bordering plains from Calaveras Co. to Merced Co.; western San Diego Co. Mar.-Aug.

Note on relationship.—This species closely resembles the aquatic form of Callitriche marginata var. longipedunculata, differing chiefly with respect to the sessile fruits. Other differences are the better development of linear and intermediate cauline leaves, the longer filaments and the winged fruits.

Locs.—Castle Peak (Mt. Stanford), Nevada Co., *Sonne;* Valley Sprs., Calaveras Co.; Oakdale, Stanislaus Co.; LaGrange, Merced Co., *Hormay* 704; San Diego, *Abrams* 3450.

Refs.—CALLITRICHE STENOCARPA Hegelm. Verhand. Bot. Ver. Brandenb. 10:114 (1868), type loc. Searsville, *Bolander,* in 1864 (first spm. cited), also Russian River, Ukiah, *Bolander* 3870. *C. palustris* var. *stenocarpa* Jepson, Man. 603 (1925).

4. **C. autumnalis** L. NORTHERN WATER STARWORT. Plants submersed in streams or fresh ponds; stems delicate, not forming tangled masses, 3 to 10 inches long; herbage without stellate pits; leaves not crowded, except somewhat on ends of branches, the blades very thin, 1-nerved, all linear to linear-lanceolate, broader at base, clasping or subauriculate, deeply notched at apex, 3 to 12 lines long; stellate pits few; bracts obsolete (rarely present); flowers 2 or 3 at a node, or often only one, the upper sometimes pistillate, the lower staminate; filaments ⅛ line long; styles early deciduous, deflexed, ½ to 1 line long; fruits sessile or subsessile,

roundish in outline, notched at apex, ¼ to ½ line long, the approximate carpels winged, closely appressed, the groove narrow, inconspicuous.

Cold fresh often running water, 100 to 5000 feet: Santa Clara Co. North to Canada, east to Colorado and New York. Europe, Asia. June.

Locs.—Gilroy, Santa Clara Co., *Jepson* 13,818; Sierra Co. (Bot. Cal. 2:77).

Var. **bicarpellaris** Fenley var. n. Leaves sometimes 3-cleft; 2 carpels rudimentary, forming a sheath at apex of carpophore; peduncles ¼ to ½ line long; bracts conspicuous, obovate, orbicular or subquadrate, ¼ to ⅓ line long; nutlets reniform, broadly winged, ¾ to 1 line long.—(Carpella 2, abortiva, ad apicem carpophori vaginam constituentia.)—Low valleys, 100 feet: San Joaquin Co. (Clements, *Mason* 4445, type); Sonoma Co. (Santa Rosa, w. of, *Fenley* 561, 562).

Refs.—CALLITRICHE AUTUMNALIS L. Fl. Suec. ed. 2, 4 (1755), type European; Jepson, Man. 603 (1925). *C. angustifolia* Hoppe, Bot. Taschenb. 155 (1792). *C. virens* Gold. Act. Mosq. 5:119 (1817). Var. BICARPELLARIS Fenley.

ZYGOPHYLLACEAE. CALTROPS FAMILY

Herbs or shrubs. Leaves (in ours) opposite, pinnate (sometimes reduced to 2 leaflets) or palmately 3-foliolate; leaflets entire; stipules interposed. Flowers perfect, regular, symmetrical or nearly so. Sepals 5, distinct or nearly so. Petals in ours 5. Stamens 10, inserted with the petals on the receptacle. Ovary usually of as many carpels as petals (rarely twice as many or fewer), its cells as many as the carpels or twice as many; style one; stigmas 1 or 5. Fruit (in ours) a schizocarp, splitting into 5 to 12 carpels, the carpels indehiscent (forming nutlets) or sometimes dehiscent.—Genera 19, species about 120, warm regions in all continents.

Bibliog.—Stillman, J. M., Gum lac from Arizona (Am. Chem. Journ. 2:34–38,—1880). Redding, B. B., Shel-lac and lac-dye [of Larrea mexicana] (Pac. Rur. Press 19:179, 273,—1880). Vail, A. M., Preliminary list of N. Am. * * * Zygophyllaceae (Bull. Torr. Club 22:229–231,—1895); Notes on Covillea and Fagonia (l.c. 26:301–302,—1899). Brandegee, T., Fagonia californica Benth. (Zoe 5:227,—1906). Parish, S. B., Tribulus terrestris (Muhl. 5:127,—1909). Vail, A. M., & Rydberg, P. A., Zygophyllaceae (N. Am. Fl. 25:103–116,—1910). Standley, P. C., The Am. species of Fagonia (Proc. Biol. Soc. Wash. 24:243–250,—1911). Johnson, E., Spread of the Puncture Vine in California (Mo. Bull. Cal. Dept. Agr. 9:330–332, 2 figs.,—1920); Puncture Vine control (l.c. 14:191,—1925; 16:354,—1927). Neville, L. S., Puncture Vine stock-feeding experiments (Mo. Bull. Cal. Dept. Agr. 17:458–461,—1928). Olsen, C., Puncture Vine (Mo. Bull. Cal. Dept. Agr. 17:691,—1928). Morrison, A. E., Puncture Vine [in Sacramento Co.] (Mo. Bull. Cal. Dept. Agr. 18:425,—1929). Ball, W. S., and Robbins, W. W., Puncture Vine (Mo. Bull. Cal. Dept. Agr. 21:211–213,—1932); Puncture Vine in California (Univ. Cal. Agr. Exp. Sta. Bull. 528:1–42, figs. 1–11,—1932).

Herbs; leaflets 4 or more pairs; fruits spiny or tuberculate; seeds without endosperm.
  Stamens opposite the petals free from them; nutlets as many as the carpels........1. TRIBULUS.
  Stamens opposite the petals adnate to their base; nutlets twice as many as the carpels............ 2. KALLSTROEMIA.
Woody plants; leaflets few; fruits smooth; seeds with endosperm.
  Leaflets 3; flowers rose-purple; fruits glabrous........3. FAGONIA.
  Leaflets 2; flowers yellow; fruits densely hairy........4. LARREA.

1. TRIBULUS Tourn. CALTROPS

Herbs, ours annuals, with even-pinnate leaves and several pairs of leaflets. Flowers yellow, solitary on the peduncles. Stamens opposite the sepals with a gland behind the filament at very base. Disk annular, 10-lobed. Ovary 5-celled; cells 3 to 5-ovuled. Stigmas 5, more or less connate. Fruit lobed, splitting into 5 nutlets; nutlets hard, indehiscent, usually muricate or spinescent on back.—Species 12, all continents but mainly tropical. (Greek tribulos, ancient name of Trapa.)

1. **T. terrestris** L. PUNCTURE VINE. Stems branching from the base, decumbent, ½ to 3 feet long; herbage whitish-pubescent; leaflets 4 to 7 pairs, oblong, 3 to 4 lines long; flowers on short axillary peduncles; petals 1 to 2 lines long; ovary 5 (or 3 or 4)-celled, in fruit splitting into as many 1 to 3-seeded nutlets and having no central axis; nutlets warty on back and with 2 stout spreading spines 2 to 3 lines long; seeds superposed, separated by transverse partitions.

Naturalized weed, native of the Old World, spreading widely over valley levels and desert mesas, 10 to 2200 feet. Apr.-Aug.

Migration note.—Tribulus terrestris, a serious agricultural pest, was probably introduced into California by ballast or incoming shipments of live stock. It was first noticed at Santa Monica in 1902 (Dav. & Mox., Fl. S. Cal. 215). After a few years there began a marked movement of this intruder along railway lines in Southern California, whence it advanced, still along the railway lines, into northern California as far as Shasta Co. Its presence was always first obvious near railway stations, but it also spread quickly over cultivated and uncultivated lands. Its occupation of the soil on the valley levels is so thoroughgoing that some thousands of acres of farming areas in the Bakersfield region have been abandoned, according to W. W. Robbins who is studying control measures. The plant has become an especially difficult problem in alfalfa fields. The presence of its burs in alfalfa or other forage lessens to a considerable degree the market value of the hay. The rapid migratory power of the species is owing in the main to the virtue of its barbed pods. By means of the barbed spines the pod is enabled to attach itself to a great variety of objects and is thus distributed with fruits, vegetables and all sorts of miscellaneous shipments carried in sacking. Through the agency of cattle and sheep it has moved promptly also along country roadways. Here it is a nuisance to the tire casings of automobiles on account of the rigid spines with which the fruit is armed, whence Puncture Vine, the folk name by which the plant is best known. It is also called Hell-bur and Bull-head. Cf. Mo. Bull. Cal. Dept. Agr. 19:468–469, 606 (1930).

Locs.—Riverside, *Martha Howland* in 1918; Colton, San Bernardino Valley, *Parish* 6965 in 1908; San Fernando Valley; Needles, *Jepson* 5489 in 1913; Barnwell, e. Mohave Desert, *W. J. Connor* in 1913; Bakersfield, *C. P. Fox* in 1905; Friant, Fresno Co., *Jepson* 13,301 in 1928; Fresno; Los Banos, *M. S. Jussel* in 1921; Tracy, *K. Brandegee* in 1907; Antioch in 1913; Kenwood, Sonoma Co., *M. S. Baker* 4869b in 1929; Willows, *C. J. Ley* in 1913; Castle Crag near Dunsmuir, *Jepson* 6160 in 1914.

Refs.—TRIBULUS TERRESTRIS L. Sp. Pl. 387 (1753), type from Europe; Jepson, Man. 603 (1925).

2. **KALLSTROEMIA** Scop.

Herbs. Leaves even-pinnate, one of each of the opposite pairs alternately smaller than the other. Leaflets a little oblique. Sepals 5 or 6, persistent. Petals 4 to 6, caducous. Stamens 10 or 12, those opposite the petals adnate to their bases, those alternate with the petals subtended on the outside by a small gland. Ovary 8 to 12-celled, the cells without transverse partitions. Stigmas 5. Fruit 8 to 12-angled, splitting into as many nutlets; nutlets mostly 1-seeded, tuberculate on the back.—Species about 12, South and North America and Australia. (Greek kallos, beautiful, and Stroemia, a genus of Capparidaceae.)

1. **K. californica** Vail. Stems branching, diffuse, 4 to 12 inches long; herbage hoary-pubescent; leaflets 10 to 14, oblong-elliptical, 3 to 6 or 12 lines long; peduncles shorter than the leaves; sepals deciduous; petals yellow, 2 to 3 lines long, little longer than the sepals; fruit 1½ to 2 lines broad, the 8 or 10 carpels with 4 or 5 sharp tubercles on the back, beak of fruit shorter than the body.

Sandy plains, 10 to 100 feet: Imperial Valley. South into Lower California.

Distribution note.—Kallstroemia californica is a rarity in California. We have only one record: Heber, *Abrams* 4002.

Refs.—KALLSTROEMIA CALIFORNICA Vail, Bull. Torr. Club 22:230 (1895). *Tribulus californicus* Wats. Proc. Am. Acad. 11:125 (1876), type loc. L. Cal., e. side, *Palmer.*

KALLSTROEMIA GRANDIFLORA Torr.; Gray, Pl. Wright. 1:28 (1852), type loc. Gila River, Ariz., *Emory.* Stems erect, widely branching and ascending, 8 to 12 inches high; herbage wholly glabrous or the upper parts (including the calyx) hispid; leaflets 8 to 18, oblong, ½ to ¾ inch long; peduncles exceeding the leaves; sepals narrowly lanceolate, acuminate, 6 to 7 lines long; petals deep yellow, 7 to 10 lines long, withering-persistent; carpels 10, pubescent, tuberculate on the back; beak of fruit longer than body.—Arizona to Texas and Mexico. Attributed to California in North American Flora (25:114), but there is no spm. in New York Botanical Garden Herbarium. Observed near Bard, e. Imperial Co., Cal., acc. J. J. Thornber in litt. We do not know of the existence of any California specimens.

3. **FAGONIA** Tourn.

Suffrutescent plants, ours with 3-foliolate leaves. Flowers rose-purple. Petals clawed, early deciduous. Ovary 5-celled, a pair of collateral ovules in each cell. Stigma 1. Fruit deeply 5-lobed, smooth, breaking up into 5 distinct carpels which separate from the persistent axis; carpels 1-seeded, dehiscent ventrally.—Species 18, Mediterranean region (Europe, Asia, Africa), southwest Africa, Chile, California. (G. C. Fagon, French botanist, 17th century.)

1. **F. californica** Benth. (Fig. 221.) Stems erect, slender, very much branched and thickly interlaced, scabrous on the angles, ¼ to 2 feet high; stipules acerose, 1 to 3 lines long; leaflets lanceolate to obovate, cuspidate, 2 to 3 lines long, the lateral ones about equaling the petiole; flowers in cymes; petals crimson, obovate, obtuse, shallowly cupped on the upper side, clawed, spreading almost rotately, 2 to 4 lines long; fruit 2 lines long, much shorter than the deflexed peduncles.

Washes and cañons, 100 to 1500 feet: throughout the Colorado Desert. East to Arizona, south to Lower California. Apr.

Locs.—Vidal, near Whipple Mts., *Newlon* 557; Corn Sprs., Chuckwalla Mts., *Munz & Keck* 4790; Beals Well near Niland, *Jaeger;* Painted Cañon, n. of Mecca, *Jepson* 11,685; Palm Cañon of Mt. San Jacinto, *Newlon* 456; Coachella, cañon e. of, *Schellenger;* Indian Wells, *Parish* 20,005; Borrego Sprs., cañon w. of, *Jones;* San Felipe Narrows, e. San Diego Co., *Jepson* 12,531; Vallecito, *Jepson* 8553; Mountain Sprs., e. San Diego Co., *Parish* 9024.

Var. **barclayana** Benth. Stems prostrate or decumbent, granulose-glandular, not scabrous; leaflets rhomboidal, 3 to 7 lines long. — Colorado Desert: Painted Cañon, n. of Mecca, *Jepson* 11,662; Coral Reef, sw. of Coachella, *Clary* 1644; Split Mt., *T. Brandegee;* Coyote Wells, sw. Imperial Co., *Newlon* 400. South to Lower California.

Refs.—FAGONIA CALIFORNICA Benth. Bot. Sulph. 10 (1844), type loc. Magdalena Bay, L. Cal., *Hinds;* Jepson, Man. 604 (1925). *F. laevis* Stand. Proc. Biol. Soc. Wash. 24:249 (1911), type loc. Yuma, Ariz., *Jones.* Var. BARCLAYANA Benth. Bot. Sulph. 10 (1844), type loc. Magdalena Bay, L. Cal., *Barclay;* Jepson, Man. l.c. (1925). *F. barclayana* Rydb. N. Am. Fl. 25:104 (1910). *F. californica* var. *glutinosa* Vail, Bull. Torr. Club 22:229 (1895), type loc. Sonora, Mex., *Pringle. F. viscosa* Rydb. N. Am. Fl. 25:104 (1910).

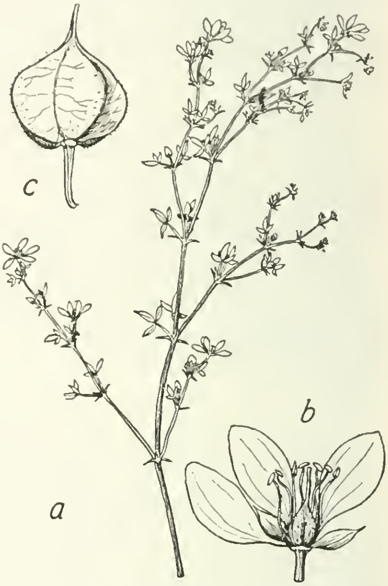

Fig. 221. FAGONIA CALIFORNICA Benth. *a*, flowering branch, × ½; *b*, long. sect. of fl., × 2½; *c*, fr., × 3.

4. **LARREA** Cav.

Evergreen rank-smelling and copiously resinous shrubs. Leaves as if divergently 2-lobed, really consisting of 2 leaflets sessile on the short rachis by a broad base. Flowers yellow, terminal and solitary on the numerous short lateral branchlets. Sepals deciduous. Petals clawed, gnawed at base. Stamens on a small 10-lobed disk, the filaments with a laciniate-toothed scale at base on the inside. Ovary 5-celled, the cells about 6-ovuled; style slender, with 5 stigmas. Fruit globose, densely white-hirsute, the 5 carpels at length separating from the axis as indehiscent 1-seeded parts.—Species 4, warm dry regions of North and South America. (J. A. de Larrea, Spanish promoter of science.)

1. **L. tridentata** Cov. var. **glutinosa** Jepson. CREOSOTE BUSH. Dark green shrub, 2 to 5 feet high, the branches ringed with a black-glandular band at the nodes and the leaves very resinous; leaflets oblong, somewhat curved, 2 to 5 lines long; petals twisted half around so as to resemble a turbine wind-mill, 3 to 4 lines long; fruit 2½ lines long, beaked by the style.

Dry desert valleys and mesas and mountain slopes and cañons, 100 to 5500 feet: Inyo Co.; Mohave and Colorado deserts. East to Texas, south to Mexico. Apr.-May.

Field note.—In the deserts the Creosote Bush is on the whole the most conspicuous woody plant. Vast areas are uniformly dotted with its dark clumps which give a green aspect to the landscape. Sometimes it occurs without marked admixture of other frutescent species; frequently it is associated with Eurotia lanata Moq., Atriplex confertifolia Wats., A. polycarpa Wats., A. torreyi Wats., Lycium andersonii Gray, Thamnosma montana Torr. & Frem., Hymenoclea salsola T. & G., Grayia spinosa Moq., or Ephedra nevadensis Wats., or most often with Franseria dumosa Gray. On the average the individuals of Franseria dumosa outnumber those of the Creosote Bush 10 or 20 to one, but the low gray bushes of the former species make no such show at a little distance, because melting so readily into the desert background.

Larrea tridentata var. glutinosa is an important zone indicator (Lower Sonoran), its limits being about as follows. On the western Mohave Desert it occurs in the Antelope Valley; on the southern side it is found at Hesperia and the desert end of Cajon Pass; the northern limits are about Cameron. In Inyo Co. it reaches north to the southerly end of Owens Lake. In eastern Inyo Co. it occurs in Death Valley and in the Panamint Range and Funeral Mts., but commonly is rare though widely distributed. In the Emigrant Cañon wash, however, it is abundant. In the Colorado Desert it ranges westward to the foothills of the San Jacinto, Santa Rosa and Laguna mountains (San Gorgonio Pass, Collins Valley, San Felipe Valley, Vallecito); eastward it spreads widely over the vast level and is impressively abundant on the great plain which stretches from Holtville to the Algodones Sandhills near Fort Yuma on the Colorado River. A solitary bush or two have been reported from the "Tulare plains" in the upper San Joaquin Valley. This species is one of many in the desert called Greasewood.

To the traveler the distinctive odor of the herbage is its most striking character. To some it is aromatic, to others it is foul, explaining the Mexican name Hideondo. The essential principle in any event completely protects the bush from grazing animals. The branches occasionally secrete on the surface a sort of gum which the native tribesmen in Southern California and Arizona employ for cementing broken pottery and making water-tight their woven baskets. (Pac. Rur. Press 19:178). An analysis of the gum made by J. M. Stillman in 1880 shows three per cent of lac dye and 61.7 per cent of gum lac (Am. Chem. Journ. 2:36). Teamsters in the desert employ a hot-water decoction of the herbage as a liniment for treating collar sores in draft horses. For use as a fuel, desert miners disfavor the entire top of the bush, the whole of which is cut away and the root-crowns then lifted with a crowbar. These compact root masses burn much like bituminous coal or pitchy pine blocks. The stems, on the other hand, which make a quick hot fire, are often the only available resource of the desert traveler, who soon finds that the green ones burn as well as dead ones.

Locs.—Inyo Co.: Owens Lake (s. end), *Jepson;* Emigrant Cañon Wash, *Jepson;* Hanaupah Cañon, Panamint Range, *Jepson* 6945; Funeral Mts., *Jepson.* Mohave Desert: Needles, *Jepson* 5487; Riverside Mt., Colorado River, *J. Grinnell;* Coolgardie yucca mesa, *Jepson;* Barstow, *Jepson* 4774; Ord Mt., *Jepson;* Stoddards Well, *Jepson;* Old Woman Sprs., *Jepson;* Victorville, *Jepson* 5609; Rosamond, w. Mohave Desert, *Davy* 2929. Colorado Desert: Chuckwalla bench, e. Riverside Co., *Schellenger* 28; Cottonwood Spr. (Cottonwood Mts.), *Jepson;* Pinto basin, *Jepson;* Thousand Palms Cañon, nw. of Indio, *Jepson* 6046; Palm Cañon of San Jacinto, *Jepson* 1347; Brawley, *S. W. Childs;* Borrego Valley, *Jepson;* Sentenac Valley, *Jepson* 12,476; San Felipe Valley, *Jepson;* Vallecito, *Jepson* 8582; Mason Valley, e. San Diego Co., *Jepson.*

Refs.—LARREA TRIDENTATA Cov. Contrib. U. S. Nat. Herb. 4:75 (1893). *Zygophyllum tridentatum* Moc. & Ses.; DC. Prod. 1:706 (1824), type from Mexico. Var. GLUTINOSA Jepson, Man. 604, fig. 596 (1925). *L. glutinosa* Engelm.; Wisliz. Exp. 93 (1848), Olla and Fray Cristobal, N. Mex. *Zygophyllum californicum* Torr. & Frem.; Frem. Rep. 257 (1845), type loc. western Mohave Desert, *Fremont,* but a nomen subnudum. *Covillea divaricata* Vail, Bull. Torr. Club 22: 229 (1895). *C. glutinosa* Rydb. N. Am. Fl. 25:108 (1910). *Schroeterella glutinosa* Briq. Veroff. Geobot. Inst. Rubel 3:664 (1925). *Neoschroetera glutinosa* Briq. Candollea 2:514 (1926).

RUTACEAE. Rue Family

Ours shrubs or small trees, with glandular-dotted or aromatic leaves. Flowers regular and symmetrical, or nearly symmetrical. Sepals and petals 4 or 5. Stamens (in ours) as many or twice as many, inserted on or outside of a hypogynous disk. Ovary superior, seated on this disk or its base encircled by it. Style 1.—Genera about 111, species about 600, all continents, chiefly tropical and warm temperate.

Bibliog.—Greene, E. L., The genus Ptelea in the w. and sw. U. S. and Mex. (Contrib. U. S. Nat. Herb. 10:49–78,—1906). Wilson, P., Rutaceae in N. Am. Fl. 25:173–224 (1911).

Leaves simple.
  Fruit a deeply 2-lobed capsule; leaves alternate……1. THAMNOSMA.
  Fruit globose, drupe-like; leaves opposite……2. CNEORIDIUM.
Leaves compound; fruit a circular samara……3. PTELEA.

1. THAMNOSMA Torr. & Frem.

Switch-like shrubs. Leaves alternate, small, narrow, soon deciduous. Flowers on scaly peduncles, the peduncles very short or sometimes almost none, solitary and terminal or scattered along the branchlets. Calyx short, 4-lobed, persistent. Petals 4, erect, scarcely spreading in anthesis. Stamens 8, equally inserted with the petals on a narrow hypogynous disk. Ovary stipitate, 2-celled, didymous, with several ovules in each cell; style one; stigma capitate. Fruit a coriaceous strongly 2-lobed capsule; cells few-seeded.—Species 4, North America and Africa. (Greek thamnos, a bush, and osme, odor.)

1. **T. montana** Torr. & Frem. TURPENTINE BROOM. Stems freely branching, broom-like, yellowish-green, 1 to 2½ feet high, thickly covered with pustulate glands; herbage glabrous, heavily odorous; leaf-blades oblanceolate, 2 to 6 lines long, sessile or subsessile; flowers 4 lines long, black-purple; petals ovate to elliptic, revolute at tip; stamens 4 long and 4 short; style slightly exserted; ovules 8 or 9 in each cell; capsule 5 lines broad, deeply parted into two subglobose lobes; lobes splitting dorsally from the apex, 1 to 3-seeded.

Dry or stony hills and mesas, 1000 to 4200 feet: mountains on the west side of the Colorado Desert; Mohave Desert; Inyo Co. East to Utah and Arizona, south to Lower California. Apr.-May.

Field note.—On the Coolgardie yucca mesa the dehiscence of the capsule was specially observed. The capsules regularly dehisce by a lateral slit across the top of each cell. This slit runs from the base of the style or summit of the placental axis at right angles to the commissure (of the two cells), but extending in each case only across the top of the cell.

Locs.—Colorado Desert (w. side): Jacumba, *Abrams* 3651; Mountain Sprs., *R. W. Sumner;* Cuyamaca Mts., *Newlon* 355; Blair Valley, e. San Diego Co., *Jepson* 8689; San Felipe; Coyote Cañon, sw. Riverside Co.; Mission Creek wash, n. end Coachella Valley, *J. T. Howell* 3322; Whitewater, *Parish;* Morongo Valley, *Jepson;* Chuckwalla Sprs., *Hall* 5892; Ord Mt., *Jepson* 5935. Mohave Desert: betw. Pinto Basin and Twenty-nine Palms, *J. T. Howell* 3320; Helendale, *Newlon* 481; Barstow, *Jepson* 4826; Lead Mt., *Jepson* 6607; Coolgardie yucca mesa, *Jepson* 6637; Summit road sta., e. of Halloran Spr., *Jepson* 15,815. Inyo Co.: Emigrant Cañon, Panamint Range, *Jepson* 7122.

Refs.—THAMNOSMA MONTANA Torr. & Frem.; Frem. Rep. 313 (1845), type loc. Virgin River, s. Utah, *Fremont;* Jepson, Man. 605, fig. 597 (1925).

Ruta L. Herbs or the stems woody at base. Leaves alternate. Flowers perfect, in terminal cymes. Stamens 8 or 10. Ovary 4 or 5-celled, the ovules 5 to each cell. Capsule 4 or 5-lobed. R. CHALEPENSIS L. Mant. 69 (1767). Aleppo Rue. Shrubby, 2 feet high; herbage glaucous; leaves bipinnately divided, 1½ to 2½ inches long; segments unequal, 3 to 6 lines long; petals yellow, fringed, 2⅓ lines long; capsule 3 lines high, its lobes pointed.—Native of the Old World, introduced: El Monte (N. Am. Fl. 25:212); Ventura, *Parish* 11,046; Kingston, ne. Mohave Desert, *E. M. Funk.*

2. CNEORIDIUM Hook. f.

Low glabrous evergreen shrub with narrow opposite entire leaves. Flowers 1 to 3 on short peduncles. Calyx short, 4-parted. Petals 4, white. Stamens 8, the ones opposite the petals much shorter; filaments dilated. Ovary globose, 1-celled, 2-ovuled, seated on an annular disk; style short, flattened, lateral (arising from near the base of the ovary); stigma capitate. Fruit globose, drupe-like, 1 to 2-seeded. Seed globose, with curved embryo; endosperm fleshy.—Species 1. (Resembling Cneorum, an Old World genus.)

1. **C. dumosum** Hook. f. Much branched bush, 2 to 3½ feet high, the herbage heavily odorous; leaf-blades linear or tapering to base, glandular-dotted, ½ to 1⅛ inches long, 1½ to 2 lines wide; peduncles solitary or clustered, 1 to 3-flowered; flowers 3 lines broad; petals obovate or elliptic; fruit reddish-brown, resinous-punctate, 3 lines in diameter.

Hills and mesas, 50 to 2600 feet: southern Orange Co.; western San Diego Co. South to Lower California. Mar.-Apr.

Locs.—Arch Beach, Orange Co., acc. *Peirson;* Bernardo, *Abrams* 3378; Clevinger Cañon, Ramona, *Jepson* 8508; Witch Creek, *Alderson;* La Jolla, *Jepson* 11,862; Pt. Loma, *Newlon* 339; betw. Dulzura and Campo, *J. T. Howell* 2965.

Refs.—CNEORIDIUM DUMOSUM Hook. f.; Baillon, Hist. Pl. 4:498 (1873); Jepson, Man. 605, fig. 598 (1925). *Pitavia dumosa* Nutt.; T. & G. Fl. 1:215 (1838), type loc. San Diego, *Nuttall.*

3. PTELEA L.

Deciduous shrubs or small trees. Leaves alternate, pinnately trifoliolate with sessile leaflets. Flowers polygamous or dioecious, small, greenish-white, in axillary paniculate cymes. Sepals, petals and stamens 4 or 5. Ovary 2-celled; cells 2-ovuled, the lower ovule abortive; style short; stigmas 2. Fruit a 2-celled 2-seeded samara, winged all around, broadly orbicular.—Species 3, temperate North America. (Greek name of the Elm, the fruit of which is similar.)

1. **P. baldwinii** T. & G. var. **crenulata** Jepson. HOP TREE. Small tree or shrub 6 to 18 feet high; herbage glabrous or slightly pubescent; leaflets elliptic, obovate or elongated-rhomboidal, rounded or acute at apex, often with abruptly cuneate base, crenulate or almost entire, 1 to 2¾ inches long; sepals very small; petals 2 to 2½ lines long; stamens hairy towards the base; fruit straw-yellow, 5 to 8 lines long, a trifle broader, tipped by the persistent style.

Cañon sides and flats in the foothills, 100 to 1500 feet: inner Coast Range from Shasta Co. to Contra Costa Co.; Sierra Nevada foothills from Tehama Co. to Mariposa Co. Apr.-May.

Field note.—This species is frequent in the cañons on the north side of Mt. Diablo, in Donner Cañon or more especially on the slopes of Mitchell Cañon. In that region the shrubs in the main bear staminate flowers only or pistillate flowers only, but there are always in these flowers vestiges of the complementary sexual organs.

Locs.—Coast Ranges: Coram, Shasta Co., *Blankinship;* Middle Creek sta., w. Shasta Co., *Heller;* Lower Lake, Lake Co., *C. F. Baker* 2985; Antioch, *Davy* 909; Summerville, Contra Costa Co., *Chesnut & Drew;* Donner Cañon, Mt. Diablo, *Jepson* 7603a; upper Marsh Creek, e. Contra Costa Co., *Jepson.* Sierra Nevada foothills: Tuscan Sprs., Tehama Co., *Annie Alexander;* Auburn, *Sonne;* Angels Camp, Calaveras Co., *Davy* 1491.

Refs.—PTELEA BALDWINII T. & G. Fl. 1:215 (1838), type loc. St. Johns, e. Florida, *Baldwin.* Var. CRENULATA Jepson, Fl. W. Mid. Cal. 249 (1901), ed. 2, 248 (1911), Man. 605, fig. 599 (1925). *P. crenulata* Greene, Pitt. 1:216 (1888), which rests on *P. angustifolia* B. & W. Bot. Cal. 1:97 (1876), "Clear Lake and on Mt. Diablo"; not P. angustifolia Benth. (1839). *P. brevistylis* Greene, Contrib. U. S. Nat. Herb. 10:73 (1906), 'California", *G. R. Vasey. P. ovalifolia* Greene, l.c., "California", *G. R. Vasey. P. cinnamomea* Greene, l.c. 74, "vicinity of Ione", *Braunton. P. bullata* Greene, l.c. 75, "Anderson's ranch, Lower Lake, Lake Co.", *Agnes Bowman. P. cycloloma* Greene, l.c. 75, mts. "near Mariposa", *Congdon.*

SIMARUBACEAE. QUASSIA FAMILY

Shrubs or trees similar to Rutaceae, but the leaves without dots and the wood and bark very bitter. Leaves alternate. Flowers perfect or unisexual, regular. Sepals and petals 3 to 5. Disk prominent, 10-lobed; stamens 6 to 10. Carpels mostly 2 to 5, distinct or united, superior. Fruit in ours drupe-like or forming a samara.—Genera 27, species 125, all continents save Europe.

Bibliog.—Desfontaines, R. L., Sur un nouveau genre d'arbre, Ailanthus glandulosus (Mem. Acad. Roy. Sci. Paris 1786:265–271, pl. 8,—1788). Bessey, C. E., The chimney-shaped stomata of Holacantha emoryi (Bull. Torr. Club 31:523–527,—1904). Small, J. K., Simarubaceae in N. Am. Fl. 25:227–239,—1911. Swingle, W. T., The early European history and the botanical name of the Tree of Heaven, Ailanthus altissima (Jour. Wash. Acad. Sci. 6:490–498,—1916).

Leaves large, odd-pinnate; fruit a samara..........1. AILANTHUS.
Leaves reduced to scales; fruit drupaceous..........2. HOLACANTHA.

1. AILANTHUS Desf.

Large trees. Leaves odd-pinnate. Flowers small, in large terminal panicles, polygamous, the staminate very ill-scented. Fruit of 1 to 5 distinct oblong samaras, with the compressed seed in the middle.—Species 7, Asia. (Ailanto, a Malakka name, meaning Tree of Heaven.)

1. **A. altissima** Swingle. TREE OF HEAVEN. Tree 20 to 60 feet high; leaves 1½ to 2 feet long; leaflets broadly lanceolate, 3 to 6 inches long, with 2 to 4 teeth near the base, the teeth with a gland beneath; samaras 1½ inches long.

Native of China, introduced and become spontaneous, 100 to 2500 feet: Sierra Nevada foothills and inner North Coast Ranges. June.

Historical note.—The Chinese miners, immigrants in California in gold days, brought with them from China seed of Ailanthus altissima, the Tree of Heaven of their temple grounds at home. This seed they planted about the placer mining camps in the Sierra Nevada foothills. The species spread, spontaneously in many places, and its colonies are now a feature of the foothill region, especially about such old-time mining camps as Mormon Bar (Mariposa Co.), Columbia, Valley Springs (Calaveras Co.), Angels Camp, San Andreas and Grass Valley. Frequently used as a dooryard ornamental or shade tree it has also run wild in the Coast Ranges about Parkfield (Monterey Co.), Berkeley, Petaluma, St. Helena, Vacaville, and Fruto (western Glenn Co.). This species is, obviously, continuing to spread locally. It is, thus far, the only exotic arboreous species in California which is aggressively spontaneous. In some deciduous fruit orchards, as in Pleasant Valley, northwestern Solano Co., it is a pest, the seedlings and shoots, in spite of cultivation, standing thickly after the manner in which Pteris aquilina displays itself on a hillslope that has been cleared of the woody cover.

Refs.—AILANTHUS ALTISSIMA Swingle, Jour. Wash. Acad. Sci. 6:495 (1916). *Toxicodendron altissimum* Mill. Gard. Dict. ed. 8, no. 10 (1768). *A. glandulosa* Desf. Hist. Acad. Roy. Sci. Mem. Paris 1786:265, pl. 8 (1788), originally from China; Jepson, Man. 606 (1925).

2. HOLACANTHA Gray

Very thorny shrubs with rigid branches. Leaves reduced to small deciduous scales. Flowers dioecious, glomerate on the branched thorns. Calyx 5 to 8-parted. Petals 7 or 8. Staminate flowers: stamens 12 to 16, the filaments hairy at base. Pistillate flowers: stamens 6 to 8, the anthers imperfect; pistils 5 to 10, lightly connivent. Drupes small, dry, ovoid.—Species 1. (Greek holos, complete, and akantha, thorn, all the branchlets thorn-like.)

1. **H. emoryi** Gray. CRUCIFIXION THORN. Five to 10 feet high; fruiting clusters very dense, 1 to 2 inches long; drupes soon dry and nut-like, 2½ to 3 lines long.

Dry or rocky mesas, 500 to 2500 feet: eastern Mohave Desert; north side of the Colorado Desert. East to southern Arizona. June.

Locs.—Daggett (lava beds ne.), *R. H. Greer;* Ludlow, acc. *Mary Beal;* Lavic, *Mary Beal;* Hayfields, Chuckwalla Mts., acc. *James Rennie.* These are the only known stations in California.

Refs.—HOLACANTHA EMORYI Gray, Mem. Am. Acad. ser. 2, 5:310 (1854), type loc. desert betw. Gila River and Tucson, Ariz., *Thurber;* Torr. Bot. Mex. Bound. 45, t. 8 (1859); Jepson, Man. 606 (1925).

BURSERACEAE. TORCHWOOD FAMILY

Trees or shrubs with alternate pinnate leaves. Calyx 3 to 5-lobed, persistent, its base lined with a disk. Petals 3 to 5, the stamens twice as many as the petals, both borne under the disk. Ovary superior, 2 to 5-celled, each cell 2-ovuled; style 1. Fruit drupaceous but dry, 1 to 5-celled, indehiscent, or the epicarp splitting into valves and falling away. Seed solitary. Endosperm none.—Genera 16, species 320, all continents, tropical or a few subtropical.

1. BURSERA Jacq.

Flowers polygamous. Ovary 3-celled. Fruit 3-angled, 3-valved, in ours by abortion 1-celled and 1-seeded.—Species about 40, North and South America, tropical and subtropical. (J. Burser, a botanist of the 16th century.)

1. **B. microphylla** Gray. Elephant Tree. Low round-headed tree with very thick stems and branches, 4 to 10 feet high; trunk diameter ½ to 2 feet; herbage glabrous; leaflets 13 to 25, linear-oblong, 2 to 3 lines long; flowers 5-merous.

Rocky banks of washes: between Fish Creek and Carrizo Creek, southwestern Colorado Desert, the only known locality in California. Arizona to Lower California and Sonora. The Mexican name is Torote.

Refs.—Bursera microphylla Gray, Proc. Am. Acad. 5:155 (1861), type loc. Sierra Tulé, Sonora, Mex., *Schott;* Jepson, Man. 607 (1925). *Elaphrium microphyllum* Rose; Rydb. N. Am. Fl. 25:250 (1911). *Terebinthus microphylla* Rose, Contrib. U. S. Nat. Herb. 10:120 (1906).

BUXACEAE. Box Family

Evergreen shrubs with leathery simple leaves and unisexual apetalous flowers. Calyx of 5 (4 to 6) sepals. Ovary superior, 2 or 3-celled; styles 2 or 3; ovules 1 or 2 in each cell.—Genera 6, species 30, temperate and subtropical, all continents save Australia.

Bibliog.—Watson, S., Buxaceae in Bot. Cal. 2:67 (1880). Pax, F., Buxaceae in Engler & Prantl, Nat. Pflzfam. 3^5:130–135, figs. 83–86 (1896).

1. SIMMONDSIA Nutt.

Leaves opposite, entire. Flowers dioecious, on short axillary peduncles, the pistillate solitary, the staminate in a capitate cluster; sepals distinct, somewhat unequal. Stamens 10 to 12. Styles 3; ovary 3-celled, becoming by abortion a 1-celled 1-seeded 3-valved fruit.—Species 1. (The naturalist, F. W. Simmonds.)

1. **S. californica** Nutt. Jajoba. Goat-nut. Rigid much branched shrub 2 to 7 feet high; leaves minutely, but the branchlets, peduncles and calyx obviously pubescent; peduncles 1 to 3 lines (rarely 1 inch) long; leaf-blades oblong to ovate, 1 to 1½ inches long, barely petioled; staminate flower 1½ to 2 lines long, its sepals broadly oblong or subspatulate; pistillate flower much larger than the staminate, 6 lines long, its sepals ovate or lanceolate and often abruptly contracted above the roundish base; capsule short-cylindric, short-pointed, somewhat acorn-like, rather less than 1 inch long.

Arid or rocky hills, 50 to 2400 feet: mountains of north side of Colorado Desert; San Jacinto Mts.; San Diego Co. South to Lower California and Mexico, east to Arizona. Apr.

Field note.—Simmondsia californica is an important forage plant for cattle browse, which often accounts for its irregular shape. The nuts are a great resource to the native people in Lower California, as formerly in Southern California. They are roasted in order to prepare them for eating, and a drink, somewhat similar to chocolate, is also prepared from them. The shrubs grow in the most arid situations, yet even so they often fruit heavily, at least in places not accessible to cattle. The natives have a saying that it requires only one rain to make a Jajoba crop. Deer Nut is also a folk name and about Mt. San Ysidro native tribesmen call the shrub Cow-nuckle.

Locs.—Chuckwalla Mts.; Cottonwood Spr., Cottonwood Mts., *Jepson* 12,577; Indio Hills, *Clary* 1168; Lookout Mt., n. of Indio, *Jepson;* Coyote Holes, e. of Warrens Well, Conchilla Range, *Jepson* 5973; Palm Cañon of San Jacinto, *Jepson* 1359; San Felipe Wash, e. San Diego Co., *J. T. Howell* 3244; Box Cañon, Blair Valley, e. San Diego Co., *Jepson* 8645; Vallecito, e. San Diego Co., *Jepson & Dutton* 8607; Myers Creek bridge, sw. Imperial Co., *Jepson* 11,781; betw. Cahuilla Valley and Aguanga, *Jepson* 1480; Cottonwood Creek valley, s. San Diego Co., *J. T. Howell* 2968; betw. Del Mar and La Jolla, *Newlon* 307; San Diego, *Harriet Schneider.*

Refs.—Simmondsia californica Nutt.; Hook. Lond. Jour. Bot. 3:401, t. 16 (1844), type loc. San Diego, *Nuttall;* Jepson, Man. 607, fig. 601 (1925). *S. pabulosa* Kell. Proc. Cal. Acad. 2:21 (1859), type loc. Cedros Isl., L. Cal. *Veatch. Buxus chinensis* Link, Enum. Pl. 2:386 (1822); Mueller in DC. Prod. 16^1:23 (1869), as synonym. *Simmondsia chinensis* Schn. Ill. Handb. Laubholz. 2:141 (1907).

EMPETRACEAE. Crowberry Family

Small evergreen shrubs. Leaf-blades linear with a deep groove on the under side. Flowers dioecious, monoecious or perfect, 3-merous. Ovary superior, 6 to

9-celled; ovules erect. Fruit a drupe.—Genera 3, species 5, North and South America, Europe, Asia.

1. EMPETRUM L.

Stems with numerous branchlets crowded with leaves. Flowers inconspicuous, solitary in the axils, scaly-bracted. Sepals and petals mostly 3. Staminate flower with 3 stamens. Pistillate flower with the stigma 6 to 9-parted into radiating lobes. Drupe black, berry-like, containing 6 to 9 nutlets.—Species 2, North and South America, Europe, Asia. (Greek en, upon, and petros, a rock.)

1. **E. nigrum** L. Black Crowberry. (Fig. 222.) Stems 6 to 15 inches long, procumbent; leaves 1½ to 2½ lines long; drupe 3 to 4 lines long.

Forming dense beds in rocky places, 1 to 50 feet: Del Norte Co. North to Alaska and British America, east to New England. Europe, Asia. Apr.

Locs.—Crescent City, *T. Howell.* Alas.: Iliuliuk, Unalaska, *Jepson* 37.

Refs.—Empetrum nigrum L. Sp. Pl. 1022 (1753), type European; Jepson, Man. 752 (1925).

ANACARDIACEAE. Sumac Family

Trees or shrubs with resinous or milky acrid juice and alternate leaves. Flowers very small, regular, either perfect or polygamous. Calyx commonly 5-parted, a glandular ring or cup-like disk lining its base. Petals commonly 5, the stamens as many or twice as many. Ovary free from the calyx and from the disk, 1-celled, 1-ovuled; styles 3. Fruit a dry berry-like drupe; seed without endosperm.—Genera 58, species 500, all continents, tropical and subtropical.

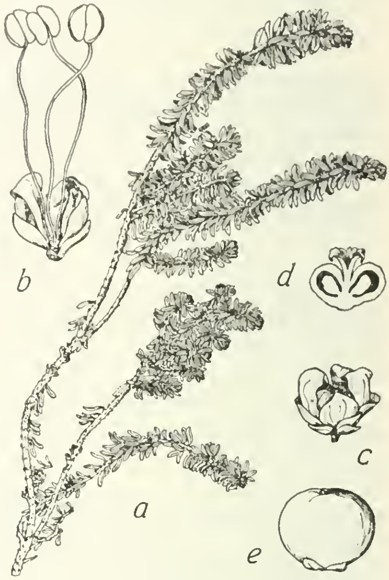

Fig. 222. Empetrum nigrum L. *a*, flowering branch, × ½; *b*, staminate fl. with a petal and a sepal removed, × 5; *c*, pistillate fl., × 5; *d*, long. sect. of pistil, × 5; *e*, fr., × 2.

Bibliog.—Engler, A., Anacardiaceae (DeCandolle, Monog. Phan. 4:172–500, tabs. 4–15,—1883). Greene, E. L., Segregates of the genus Rhus (Lflts. 1:144,—1905). McNair, J. B., Secretory canals of Rhus diversiloba (Bot. Gaz. 65:268–273,—1918); A study of Rhus diversiloba with special reference to its toxicity (Am. Jour. Bot. 8:127–146, figs. 1 and 2, and pl. 2,—1921); The transmission of Rhus poison from plant to person (l.c. 238–250,—1921); Rhus dermatitis, its pathology and chemotherapy, 1–298, pls. 1–3 and figs. 1–14,—1923; Taxonomy of Poison Ivy (Field Mus. Publ. Bot. 4:55–78,—1925); Taxonomy and range of Poison Ivy (Sci. 61:589,—1925).

1. RHUS L. Sumac

Shrubs or small trees. Leaves (in ours) simple or 3-foliolate. Stamens 5. Drupe flattened, with rather thin and dry flesh.—Species 120, all continents, temperate and subtropical regions. (Greek rhous, the name of Theophrastus for the sumac.)

Leaves 3-foliolate; deciduous shrubs; throughout Cal.
  Flowers greenish, in panicles; drupe whitish, the stone rough..........1. *R. diversiloba.*
  Flowers yellowish, in spikes; drupe red, the stone smooth..........2. *R. trilobata.*
Leaves simple, leathery; evergreen shrubs; flowers in panicles; S. Cal.
  Panicle much branched, with slender divisions, glabrous or nearly so; drupe whitish..........3. *R. laurina.*
  Panicle composed of stout spikes, finely pubescent; drupe red.
    Leaf-blades elliptic, rounded at apex..........4. *R. integrifolia.*
    Leaf-blades ovate, acute or acuminate..........5. *R. ovata.*

1. **R. diversiloba** T. & G. Poison Oak. (Fig. 223.) Erect shrub 4 to 8 (or 13) feet high, or the stems climbing tree trunks by adventitious rootlets to a height of 10 to 115 feet; leaflets variable, roundish to ovate, variously lobed or toothed; panicles axillary, appearing with the leaves, somewhat pendulous; flesh of the whitish drupe marked with black fibres.

Foothills, valley stream-banks, river terraces, mountain slopes and mountain valleys, 5 to 5000 feet, widely distributed and often abundant throughout cismontane California. South to Lower California, north to Oregon. Mar.-Apr.

Geog. note.—Rhus diversiloba grows in a greater number of frutescent associations than any other shrub in California. In San Diego County it is associated with characteristic woody species of cismontane Southern California, all of which are wholly different from the associated species in various northern regions, as the Sierra Nevada foothills or Vaca Mountains, these in each case being in the main different from each other and yet again from the associated species in the case of the Redwood belt. It has a wider geographic range than any other California shrub and grows under a greater variety of soil conditions than any other; though usually preferring good soils or rich loams, it grows in blue adobe, in saline soils, in gray clays, in sandy flats, in heavy gravel deposits and in the crevices of outcropping rock piles. It is also adapted to a greater range of rainfall and temperature than any other California shrub and is especially remarkable for its extreme shade tolerance and its tolerance of intense insolation. In common with all other woody vegetation it is absent from wide areas on the inner foothills and the plains of the Great Valley. Its preferred habitats are moist slopes in the hills; in such situations it is seldom lacking. It is also curious to add that of all native woody vegetation about the great Keswick smelter on the upper Sacramento River, the species least injured by smelter fumes was Rhus diversiloba; at a given station near the smelter it lived in spite of the conditions, while practically all other species were seriously injured or in the main destroyed.

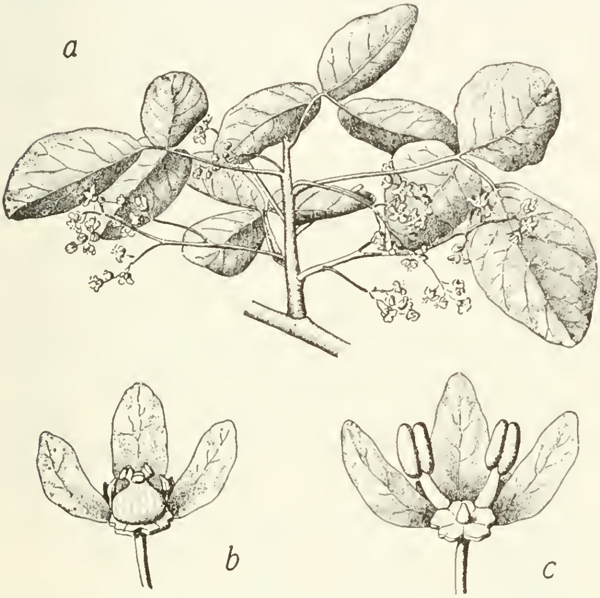

Fig. 223. Rhus diversiloba T. & G. *a*, flowering branchlet, × ⅔; *b*, long. sect. of pistillate fl., × 5⅓; *c*, long. sect. of staminate fl., × 5⅓.

In number of individuals Poison Oak exceeds, in our judgment, any other shrub species in California. While the vast colonies of Adenostoma fasciculatum or the mesa growths of Larrea tridentata are impressive to the eye, Rhus diversiloba occurs over a much larger area than either. It is often an unobtrusive shrub—scarcely noticed in many formations and yet the individuals are really very numerous. When, for example, a Mendocino hillside wooded with Arbutus menziesii, Quercus douglasii and various shrubs is cleared, the response of Poison Oak by crown-sprouting tells the story of its abundance. It grows in the openly oak-wooded foothills, in Douglas Fir forest, in the Redwood belt, along river banks and "bottoms" and even in salt marshes, often in chaparral and rarely in chamisal. In altitudinal distribution the species extends from sea-level to about 5000 feet. In the southern Sierra Nevada it grows as high as 4760 feet; it is not found on the Yosemite Valley floor, but occurs in Hetch-Hetchy and on the slopes of Rancheria Mt. above Hetch-Hetchy at about 4500 feet; in Butte Co. it is found as high as 3800 feet. A very large number of bird species feed on the seed and are a highly important factor in distribution. Quail in particular are fond of the seed. Their habits often account for intensified local occurrence of Rhus diversiloba.

Biol. note.—In outline of leaflets, shape and size, Rhus diversiloba is notoriously variable. Very pronounced series of variations may be gathered from a single individual. In deep shade the leaflets become very large and thin, in dry situations reduced in size and thickened. The flowers are more or less polygamous. In certain districts there are, distinctly, staminate shrubs and pistillate shrubs, the former of course setting no fruits. The staminate shrubs shed their inflorescences rather promptly. Even in the same panicle the petals vary in number from 4 to 6, though commonly 5. The stamens also vary, but vary with the petals.

Bees make honey from the flowers. The nectar disk contains none of the toxic oil of the shrub and the honey is, therefore, not poisonous.

The shrub is on the whole a valued plant for browse. Horses feed upon it at nearly every season, and cattle do so whenever grass or, especially, green forage becomes scarce. It is, on this account, particularly valued in dry seasons when it may be depended upon to prevent starvation of range herds.

Note on toxicity.—As a skin irritant, often causing intense and extremely painful dermatitis, the plant juice is highly poisonous. On exposure to the poison reaction varies greatly in different individuals. Great and prolonged pain is the lot of some persons, and in rare cases the eyesight has been lost. On the other hand many persons escape with small inconvenience and a very few have complete immunity. The poison is a non-volatile oil and a person may be poisoned only by actual contact with the bushes, or through smoke particles, or by touching objects where the poison has been distributed. The clothing and body of persons passing through Rhus diversiloba thickets may become heavily infected with the oil, and in this manner minute particles are unconsciously distributed on stair-railings, door-handles, seats and other places. After exposure of the body to the poison the oil may be dissolved and removed from infected spots on the skin by use of alcohol and a sterilized cotton swab, the alcohol to be changed frequently and each swab of cotton to be used only once, that is for one stroke only and instantly rejected, for the reason that the dissolved oil, even in the most minute quantities, spreads so readily.

Locs.—S. Cal.: San Diego, *W. S. Wright* 21; Clevinger Cañon, Ramona, *Jepson;* Palomar Mt., *Jepson;* Eaton Cañon, San Gabriel Mts., *Peirson* 325. Coast Ranges: Los Gatos Creek, w. Fresno Co., *Jepson* 12,196; Arroyo Seco, Santa Lucia Mts., *Jepson;* Monterey, *Berg;* Felton, Santa Cruz Co., *Jepson* 4169; Saratoga, Santa Clara Co., *Jepson;* Tunitas Creek, San Mateo Co., *Jepson;* Mt. Diablo, *Jepson;* Berkeley, *Jepson* 13,912; Nortonville, e. Contra Costa Co., *Jepson* 15,716; Green Valley, sw. Solano Co., *Jepson* 1739; Vaca Mts., *Jepson;* York Creek, St. Helena, *Jepson* 2427; betw. Ft. Bragg and Sherwood, *Jepson;* School-house Creek, Cahto, Mendocino Co., *Jepson;* Pepperwood, Humboldt Co., *Jepson;* Martin ranch, South Fork Trinity River, *Jepson* 2000; Dunsmuir, Siskiyou Co., *Jepson;* Cottage Grove, Klamath River, *Jepson.* Great Valley: lower Sacramento River islands (Erythea 1:242); Rosewood, w. Tehama Co., *Jepson.* Sierra Nevada foothills: Nelson, Middle Tule River, *Jepson;* Clough Cave, South Fork Kaweah River, *Jepson;* Cedar Creek, North Fork Kaweah River, *Jepson;* Auberry, Fresno Co., *Jepson;* El Portal, Mariposa Co., *Jepson;* Coulterville, *Jepson;* Hetch-Hetchy, *Jepson;* Yankee Hill, Tuolumne Co., *Jepson* 6414; Gwin Mine, Calaveras Co., *Jepson* 1760; Auburn, *Sonne;* Berry Creek, Butte Co., *Jepson;* Rich Pt., Middle Fork Feather River, *Jepson;* Belden, Plumas Co., *Jepson;* Cow Creek Mts., Shasta Co., *Baker & Nutting.*

Refs.—RHUS DIVERSILOBA T. & G. Fl. 1:218 (1838), type loc. "borders of woods, etc., Oregon," *Douglas, Nuttall,* and "California," *Beechey, Nuttall;* Jepson, Man. 608, fig. 602 (1925). *Toxicodendron diversilobum* Greene, Lflts. 1:119 (1905). *R. toxicodendron* var. *diversiloba* K. Bdg. Zoe 2:345 (1892). *R. diversiloba* f. *radicans* McNair, Field Mus. Publ. Bot. 4:61 (1925). *Toxicodendron oxycarpum* Greene, Lflts. 1:121 (1905), Santa Cruz, *Ball. T. isophyllum* Greene, l.c., type loc. San Jacinto, *Leiberg* 3117. *T. comarophyllum* Greene, Lflts. 1:120 (1905), type loc. Tighe's, at foot of Ballena grade, San Diego Co., *Palmer. T. dryophilum* Greene, Lflts. 1:121 (1905), type loc. Little Chico Creek, Butte Co., *R. M. Austin. T. vaccarum* Greene, Lflts. 1:122 (1905), type loc. Cow Creek Mts., Shasta Co., *Baker & Nutting.*

2. **R. trilobata** Nutt. SQUAW BUSH. Diffusely branching, 2 to 3½ (or 7) feet high; leaflets broadly ovate or elliptic, cuneate at base, crenate or lobed; flowers pale yellow, appearing before the leaves, borne in terminal often clustered spikes; drupe viscidly pilose, red or bright crimson.

Rich hill slopes or flats or cañon bottoms in the hill country, 100 to 4000 feet: almost throughout California. North to Oregon, east to the Rocky Mts. Mar.

Econ. note.—The Squaw Bush was of importance to the native tribes in their crafts, since the long slender split stems were used as splints in their finest basket making. The berries, used green and eaten with salt, were highly appreciated. The bushes crown-sprout. About North Fork sta., Fresno Co., where this species is common, it is called Stink Bush.

Locs.—S. Cal.: Jamul, s. San Diego Co., *Wiggins* 1946; Hot Springs Mt., San Diego Co., *Jepson* 8745; Indian Cañon, Collins Valley, ne. San Diego Co., *Jepson;* Palomar Mt., *Jepson;* Vandeventer ranch, Riverside Co., *Jepson;* San Bernardino, *Parish;* Arroyo Seco and Monrovia cañons, San Gabriel Mts., *Peirson* 342; Arrastre Cañon, San Gabriel Mts., *Peirson* 418; Cottonwood Spr., Cottonwood Mts., n. of Mecca, *Jepson* 12,571a; New York Mts., e. Mohave Desert, *Jepson;* Mono Flat, Santa Barbara Co., *A. L. Grant* 1684. Coast Ranges: Pozo to La Panza, San Luis Obispo Co., *Condit;* Waltham Creek, w. Fresno Co., *Jepson;* Miller Cañon, Vaca Mts., *Jepson* 13,915; Putah Cañon, *Jepson* 13,918; Pope Creek, Berryessa Valley, *Jepson* 10,411; Conn Creek, Napa Range, *Jepson;* Middleton grade, Mt. St. Helena, *Jepson* 13,914; Knoxville grade to Lower Lake, *Jepson* 13,917; Hough's Sprs., ne. Lake Co., *Jepson* 9023; Cedar Flat, Trinity Co., *Tracy* 7525; Edgewood, Siskiyou Co. (N. Am. Fauna 16:152). Sierra Nevada: Cold Spr., North Fork Tule River, *Jepson;* Cedar Creek, North Fork Kaweah River, *Jepson;* Fresno Flats, *Jepson* 12,850; Mariposa Co. (Zoe 3:27); Duck Bar, Stanislaus River, *A. L. Grant* 711; Dana, ne. Shasta Co., *Jepson.* Inyo Co.: Hanaupah Cañon, Panamint Range, *Jepson* 7038.

Var. **anisophylla** Jepson. Leaves small, the lateral leaflets unequal.—Desert region from the Cottonwood Mts. to the Panamint Range.

Refs.—Rhus trilobata Nutt.; T. & G. Fl. 1:219 (1838), "in the central chain of the Rocky Mountains", *Nuttall;* Jepson, Man. 608, fig. 603 (1925). *Toxicodendron trilobatum* Ktze. Rev. Gen. Pl. 1:154 (1891). *Rhus trilobata* var. *quinata* Jepson, Erythea 1:141 (1893), type loc. hills n. of Berryessa Valley, ne. Napa Co., *Jepson* 13,921. *Schmaltzia quinata* Greene, Lflts. 1:139 (1905). *S. malacophylla* Greene, Lflts. 1:138 (1905), type loc. Griffith Park, Los Angeles, *Braunton. S. straminea* Greene, Lflts. 1:139 (1905), type loc. Lytle Creek, San Gabriel Mts., *Leiberg. S. cruciata* Greene, l.c., type loc. Hot Sprs., n. San Diego Co., *Palmer. S. anomala* Greene, l.c., type loc. Little Chico Creek, Butte Co., *R. M. Austin.* Var. anisophylla Jepson, Man. l.c. *Schmaltzia anisophylla* Greene, Lflts. 1:136 (1905), type loc. Surprise Cañon, Panamint Mts., *Fisher* 618.

3. **R. laurina** Nutt. Laurel-Sumac. Mangla. Very leafy shrub, 5 to 7 (or 13) feet high, exhaling an aromatic odor; leaf-blades ovate or lanceolate, abruptly mucronate, 1½ to 5 inches long, on petioles ¼ to 1¾ inches long; panicle conical, dense; flowers ½ to 1 line long; drupe whitish, very small.

Mesas, hillslopes and valley flats, 5 to 2500 feet: cismontane Southern California, mostly near the coast. South to Lower California. June-July.

Locs.—Santa Barbara, *Abrams* 4154; San Fernando, *Parish* 1928; Mt. Wilson, *C. E. Hutchinson;* lower Rubio Cañon, San Gabriel Mts., *Peirson* 105; Avalon, Santa Catalina Isl., *Jepson* 3049; Temescal Wash, *Jepson* 1579; Fallbrook, n. San Diego Co., *Parish* 2248; Rainbow, San Diego Co., *Parish* 4462; San Diego, *Palmer* 48.

Refs.—Rhus laurina Nutt.; T. & G. Fl. 1:219 (1838), type loc. Santa Barbara, *Nuttall;* Jepson, Fl. W. Mid. Cal. ed. 2, 249 (1911), Man. 608, fig. 604 (1925). *Toxicodendron laurinum* Ktze. Rev. Gen. Pl. 1:154 (1891). *Malosma laurina* Nutt.; Engler in DC. Monog. Phan. 4:393 (1883).

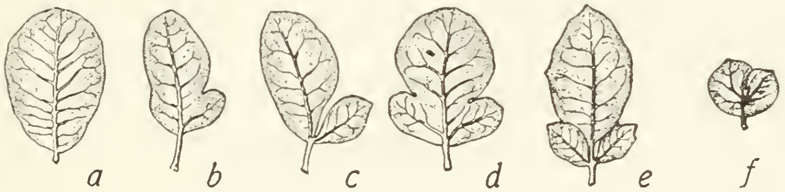

Fig. 224. Rhus integrifolia B. & W.; variations in leaf from a single shrub, × ⅓.

4. **R. integrifolia** B. & W. Lemonade-berry. Shrub 2 to 12 feet high, or sometimes a small tree attaining 20 to 25 feet; leaf-blades elliptic, dark green, leathery, entire or with a few small sharp teeth, 1 to 2½ inches long, on petioles 1 to 5 lines long; panicles ashy-puberulent; flowers 2 to 3 lines long; bracts, sepals and petals ciliolate.

Mesas and hillslopes, 25 to 2000 feet: cismontane Southern California. South to Lower California. Dec.-Apr.

Field note.—Thickets of Rhus integrifolia are often a characteristic feature of mesas, especially on headlands along the coast. Such thickets, 3 to 6 feet high, are remarkably dense, forming low rounded mounds 10 to 20 feet broad. The berries are rather strongly flattened and are covered with a thin cream-like secretion that is milky in color. This secretion is used to make an acid drink.

While the leaves are typically entire, those of a single shrub may sometimes show significant variations in segmentation (see fig. 224): a marked lobe on one or both sides towards the base which in other leaves are exhibited as distinct leaflets. These variants doubtless represent reversions to the ancestral leaf type in the genus Rhus, that is, a pinnately compound structure.

Locs.—Santa Barbara, *J. E. Roadhouse;* Oxnard, *Davy* 7809; Santa Monica, *Davy* 2769; Monrovia Cañon, San Gabriel Mts., *Peirson* 313; Los Angeles, *E. D. Palmer;* Swain Cañon, Santa Catalina Isl., *Jepson* 3054; Box Springs Mt., Riverside, *M. F. Barnes;* Cuyamaca Mts. (Bull. N. Y. Bot. Gard. 6:403); La Jolla, *Jepson* 11,840; Soledad River, *Jepson* 1613; San Diego, *Jepson* 6650.

Refs.—RHUS INTEGRIFOLIA B. & W. Bot. Cal. 1:110 (1876); Jepson, Fl. W. Mid. Cal. ed. 2, 249 (1911), Man. 608, fig. 605 (1925). *Styphonia integrifolia* Nutt.; T. & G. Fl. 1:220 (1838), based on spms. from San Diego and Santa Barbara, *Nuttall. S. serrata* Nutt.; T. & G. l.c., based on spms. from San Diego and Santa Barbara, *Nuttall. Toxicodendron integrifolium* Ktze. Rev. Gen. Pl. 1:154 (1891). *Neostyphonia integrifolia* Shaf.; Britt. & Shaf. N. Am. Trees 612 (1908).

5. **R. ovata** Wats. SUGAR-BUSH. Rounded shrub, the crown often broader than high, or small thick-headed tree, 6 to 18 feet high; leaf-blades broadly ovate, bright green, shining, 1¼ to 2½ inches long, on petioles 4 to 6 lines long; panicle dull-puberulent or glabrate.

Dry hills, 200 to 5000 feet: intermontane and cismontane Southern California, most common back from the coast. East to Arizona, south to Lower California. Apr.-May.

Locs.—Santa Barbara, *Dunn;* Santa Catalina Isl. (Erythea 7:136); Millards Cañon, San Gabriel Mts., *Peirson* 106; San Bernardino, *Parish* 2018; San Jacinto River, *Jepson* 1258; Idyllwild, San Jacinto Mts., *M. F. Spencer;* Temecula River, *Jepson* 1566; Indian Cañon, Collins Valley, ne. San Diego Co., *Jepson;* Warner Pass, e. San Diego Co., *Jepson* 8534; Mountain Springs grade, e. San Diego Co., *Jepson* 11,824; San Diego, *M. F. Spencer* 137.

Refs.—RHUS OVATA Wats. Proc. Am. Acad. 20:358 (1885), "San Diego to Los Angeles Co;" Jepson, Fl. W. Mid. Cal. ed. 2, 249 (1911), Man. 609, fig. 606 (1925). *Neostyphonia ovata* Abrams, Bull. N. Y. Bot. Gard. 6:403 (1910).

SCHINUS MOLLE L. Pepper Tree. Dioecious tree; leaves pinnate, with numerous lanceolate serrate leaflets; flowers yellowish-green, borne in panicles; stamens 10; drupes globose, red, size of a pea.—Native of Peru, cultivated as a street tree in California; spontaneous in Santa Ana Cañon, Orange Co., and in Temescal Cañon, Riverside Co., acc. J. T. Howell.

KOEBERLINIACEAE. KOEBERLINIA FAMILY

Trees or shrubs. Leaves minute or scale-like, alternate, early deciduous. Flowers in ours 5-merous, the stamens as many as the petals or twice as many. Ovary superior, seated on a short fleshy stipe or base; placentae axial.—Genera 2, species 2, southwestern North America.

Bibliog.—Loesener, Th., Canotia in Engler & Prantl, Nat. Pflzfam. Nachtrage 1:224–225, fig. 128a (1897). Barnhart, J. H., Koeberliniaceae in N. Am. Flora 25:101–102 (1910).

1. CANOTIA Torr.

Leafless shrub or small tree with slender spinose branchlets. Flowers white in small axillary racemes. Pedicels bracted and jointed above the base. Sepals, stamens and petals 5. Ovary 5-celled; style 1; stigma 1. Capsule woody, septicidally 5-valved, the valves 2-cleft. Seeds solitary in each cell, winged.—Species 1. (The Mexican name.)

1. **C. holacantha** Torr. (Fig. 225.) Eight to 18 feet high; flowers 2 lines long; capsule oblong, beaked, 9 to 12 lines long, the seeds half as long.

Dry hills, 4000 to 5000 feet: eastern Mohave Desert. East to Arizona. May-July.

Locs.—Providence Mts. (Bot. Cal. 1:190); Needles (Dav. & Mox., Fl. S. Cal. 214).

Refs.—CANOTIA HOLACANTHA Torr. Pac. R. Rep. 4:68 (1857), type loc. Williams River, Ariz., *Bigelow;* Rothrock, Bot. Wheeler 81, p. 1 (1878); Jepson, Man. 609 (1925).

CELASTRACEAE. BURNING BUSH FAMILY

Shrubs with angled branches and simple leaves. Flowers small, perfect in ours, regular or a little irregular, 4 or 5 (or 6)-merous with jointed pedicels. Calyx deeply parted, persistent. Petals inserted under the free margin of a very thick and conspicuous disk which fills the saucer-like base of the calyx. Stamens commonly 4, 5 or 10, inserted on the disk. Ovary 2 to 5-celled, immersed in or surrounded by the disk; styles united into one, in ours short or none; stigma 3 to 5-lobed. Fruit a capsule or follicle, free from the calyx. Seeds with an aril; embryo large; endosperm fleshy.—Glossopetalon has a 1-celled ovary.—Genera 35, species 430, all continents, temperate and tropical regions.

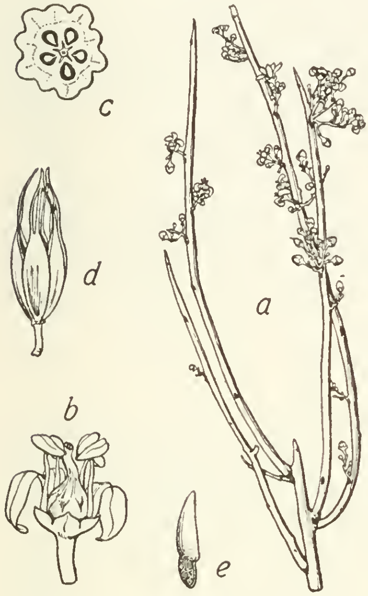

Fig. 225. Canotia holacantha Torr. *a*, flowering branch, × ½; *b*, fl., × 3; *c*, cross sect. of ovary, × 6; *d*, fr., × ¾; *e*, seed, × 1.

Bibliog.—Trelease, W., Revision of N. Am. Celastraceae (Trans. St. Louis Acad. Sci. 5:349–357,—1889). Loesener, Th., Celastraceae in Engler & Prantl, Nat. Pflzfam. 3^5:189–222, figs. 117–128 (1892).

Leaves opposite; petals red or purplish, roundish; fruit a capsule; unarmed shrubs; mostly cismontane.
  Large erect shrubs; leaves petioled; seed completely enclosed in a fleshy red aril..1. Euonymus.
  Small prostrate shrubs; leaves subsessile; seed with a whitish aril at base..........2. Pachystima.
Leaves alternate; petals white or greenish-white, narrow; fruit a follicle; seed with a white aril at base; branches spinescent; deserts................................3. Glossopetalon.

1. EUONYMUS L. Burning Bush

Large shrubs. Leaves opposite, petioled, deciduous (in ours), with minute stipules or none. Flowers purplish, in few-flowered cymes on axillary peduncles. Calyx-lobes, petals and stamens 5 (rarely 6 or 4). Ovary 3 to 5-celled, the cells 2 to 6-ovuled. Capsule 3 to 5-lobed, the cells usually 1-seeded. Seeds covered with a fleshy red aril.—Species 70, all continents except South America, chiefly in temperate regions. (Greek eu, good, and onoma, a name.)

1. **E. occidentalis** Nutt. Western Burning Bush. Erect shrub (or sometimes a small tree) with slender often straggling branches, 6 to 18 feet high; leaf-blades glabrous, thin, ovate or often broadest above the middle and abruptly acuminate, serrulate, 1½ to 5½ inches long, on petioles 3 to 7 lines long; peduncles 1 to 2½ inches long, 1 to 5-flowered; flowers 4 to 5 lines broad; petals roundish, brownish-purple, finely dotted and with scarious margins; capsule depressed, smooth, deeply 3-lobed.

Wooded cañons and stream borders, 5 to 2000 feet: Redwood belt from the Santa Cruz Mts. to Humboldt Co.; Siskiyou Co.; Plumas Co. East to Nevada, north to Washington. May-June.

Locs.—Santa Cruz, *McLean;* Big Basin, Santa Cruz Mts., *Jepson;* Butano Creek, Santa Cruz Co., comm. *Susie Mott;* Pilarcitos Cañon, San Mateo Co., *Bioletti;* Mt. Tamalpais, *Jepson* 1192; Papermill Creek, Marin Co., *Congdon;* Inverness, Marin Co., *Jepson* 557g; betw. Guerneville and Monte Rio, *E. Ferguson* 249; Camp Meeker, Russian River, *Mabel White;* Ft. Bragg, *Mathews;* Branscomb, Mendocino Co., *Rowena Beans;* Laytonville, *Jepson* 13,920; Rattlesnake Creek, Idol House, nw. Mendocino Co., *Jepson* 2199; Pepperwood, Humboldt Co., *Jepson;* Buck Mt., Humboldt Co., *Tracy* 2866; Grouse Creek, Humboldt Co., *Chesnut & Drew;* Russian Creek, Siskiyou Co., *Butler* 407; Woolly Creek, Siskiyou Co., *Butler* 20; Plumas Co. (Bot. Cal. 2:438).

Var. **parishii** Jepson. Bark whitish; peduncles 3 to 6-flowered.—Montane cañons, 5000 to 6000 feet: Cuyamaca Mts. to San Jacinto Mts. June-July.

Tax. note.—Euonymus parishii Trel. has been reduced to varietal rank. Its peduncles are no longer than in E. occidentalis and they are usually 3 or 4-flowered, with the flowers very slightly if at all smaller. We cite: Strawberry Valley, Mt. San Jacinto; Palomar Mt., *Parish;* Cuyamaca Mts., *T. Brandegee.*

Refs.—Euonymus occidentalis Nutt.; Torr. Pac. R. Rep. 4:74 (1857), based on *E. atropurpureus* var. *b* T. & G. Fl. 1:258 (1838), type from Oregon, *Nuttall;* Jepson, Fl. W. Mid. Cal.

253 (1901), ed. 2, 249 (1911), Man. 609, fig. 607 (1925). Var. PARISHII Jepson, Man. 610. *E. parishii* Trel. Trans. Acad. Sci. St. Louis 5:354 (1889), type loc. San Jacinto Mts., *S. B. & W. F. Parish* 957.

2. **PACHYSTIMA** Raf. MOUNTAIN LOVER

Low evergreen shrubs with squarish twigs and opposite coriaceous leaves with minute deciduous stipules. Flowers small, perfect, solitary or in few-flowered axillary cymes shorter than the leaves. Calyx-lobes, petals and stamens 4. Stamens inserted on the edge of the rounded disk. Ovary 2-celled, each cell with 2 ovules. Capsule not lobed, 1 to 2-seeded. Seed with a pale lacerate aril at base.—Species 2, North America. (Greek pachus, thick, and stima, stigma.)

1. **P. myrsinites** Raf. OREGON BOX-BUSH. Densely branched, very leafy, 1 to 3 feet high, or sometimes nearly prostrate and rising about 6 inches from ground; leaf-blades ovate to obovate or spatulate, ½ to 1 (or 1½) inches long, serrulate above the base, subsessile; peduncles about 1 line long, 1 to 3-flowered; flowers 1½ to 2 lines wide; petals ovate, deep red.

Moist sandy slopes in the mountains, 2200 to 5600 feet: Humboldt Co. to Siskiyou Co.; Butte Co. to Modoc Co. East to the Rocky Mts., north to British Columbia. May-July.

Locs.—North Coast Ranges: Brannan Mt., n. Humboldt Co., *Tracy* 6042; Trinity Summit, *Davy* 5754; Dunsmuir, Siskiyou Co., *Jepson* 6158; Mt. Eddy, *Copeland* 3880; Edgewood, Siskiyou Co., *Kisling;* Kidder Creek, Siskiyou Co., *Butler* 1219; Cold Spr., Woolly Creek, w. Siskiyou Co., *Butler* 20; Marble Mt., *Chandler.* Northern Sierra Nevada: South Yuba River, Butte Co. (Pac. R. Rep. 4:74); Forestdale, Modoc Co., *M. S. Baker;* Happy Camp Mt., *L. S. Smith* 1246.

Refs.—PACHYSTIMA MYRSINITES Raf. Fl. Tellur. 42 (1838), type loc. Hungry Creek, n. Ida., *Lewis* (cf. Piper, Contrib. U. S. Nat. Herb. 11:384,—1906); Jepson, Fl. W. Mid. Cal. 253 (1901), Man. 610, fig. 608 (1925).

3. **GLOSSOPETALON** Gray

Deciduous shrubs with slender spinescent branches. Leaves small, alternate, entire, with minute stipules. Flowers 4 to 6-merous, one at each axil, borne on a slender pedicel. Calyx parted into unequal lobes. Petals narrow-oblanceolate, much longer than the calyx. Stamens mostly 5 to 10, inserted under the edge of the crenately 8 or 10-lobed disk. Ovary 1-celled, with 2 ovules; stigma sessile. Follicle obliquely ovoid, finely striate, 1 or 2-seeded, splitting down the ventral suture. Seed with a small thin white aril.—Species 1. (Greek glossa, tongue, and petalon, petal, because of the shape of the corolla parts.)

1. **G. spinescens** Gray. GREASE THORN. Intricately branched, 1 to 4 feet high; leaf-blades oblong or obovate, glaucous, glabrous or nearly so, 1½ to 3 lines long, narrowed to a very short but slender petiole with a broad base and awl-like stipules; pedicels shorter than the leaves; flowers 1 to 2 lines long; calyx-lobes and petals usually 5, sometimes 4; stamens 6 to 10, rarely 5 or 4; pod 2 lines long, containing 1 or 2 brown seeds.

Desert cañons, 3000 to 6500 feet: Mohave Desert; Inyo Co. South to northern Mexico, east to Colorado and Texas, and north to eastern Oregon. Apr.

Note on relationship.—It is only with reluctance and with certain reservations that one includes the genus Glossopetalon in Celastraceae. Its gynoecium, so far as observed by us, always consists of a single carpel which is 1-celled and 1 or 2-ovuled. The small and very short awl-like persistent stipules are, however, in favor of the reference to this family. The blades are jointed near the base and fall away from the persistent petiolar base which is thickened or rounded and to which the short subulate stipules are adnate.

The form called Glossopetalon nevadense Gray does not differ essentially in pubescence, number of flower parts or in any other character as yet suggested from G. spinescens. Both G. spinescens and G. nevadense are markedly variable in stamen number. While the follicle is readily dehiscent, the ovary, we have noticed, is sometimes open along the ventral suture. The delicate and slender petals are early deciduous or fall readily in drying, hence they are rarely seen in herbarium specimens. The aril of the seed is circular and cut or dissected to the base into very narrow or filiform segments.

Locs.—Cushenbury Sprs., *Parish;* Providence Mts., *T. Brandegee;* Clark Mt., *Munz* 12,982; Mt. Laura near Erskine Creek, Kern Co., *Purpus* 5520; Surprise Cañon, Panamint Range, *J. T. Howell* 3950; Black Cañon, White Mts., *Duran* 2645. Nevada: Soda Springs Cañon, Mineral Co., *Shockley* 588; Pyramid Lake, *Lemmon.*

Refs.—GLOSSOPETALON SPINESCENS Gray, Pl. Wright. 2:29, t. 12B (1853), type loc. Frontera, N. Mex., *Wright* 1347; Jepson, Man. 610 (1925). *G. nevadense* Gray, Proc. Am. Acad. 11:73 (1876), type loc. n. Washoe Co., Nev., *Lemmon & Case. Forsellesia spinescens* Greene, Erythea 1:206 (1893).

STAPHYLEACEAE. Bladder-nut Family

Shrubs or small trees. Leaves opposite, pinnately compound, with 3 to several leaflets, usually with minute often caducous stipules and stipels. Flowers regular, perfect. Calyx-lobes and petals 5. Stamens 5, inserted outside a large disk. Ovary superior, 3-celled. Fruit a capsule, thin, opening at apex. Seeds very hard, with shining testa; endosperm present.—Genera 5, species 21, all continents except Africa and Australia.

1. STAPHYLEA L. Bladder-nut

Shrubs. Flowers white, in drooping raceme-like clusters terminating the branchlets. Calyx deeply 5-parted, the lobes erect, whitish. Petals erect. Ovary consisting of 3 carpels united in the axis, their long styles lightly cohering. Capsule large, inflated, bladder-like, 3-celled, the cells 1 to 4-seeded.—Species 7, North America, Europe and Asia, temperate. (Greek staphule, a cluster.)

1. **S. bolanderi** Gray. Sierra Bladder-nut. Glabrous shrub 6 to 10 feet high, or a slender tree up to 20 feet high; leaflets 3, roundish-ovate, acute, finely serrate, 1½ to 2½ inches long; pedicels ¾ to 1 inch long; sepals several-nerved, a little shorter than the petals; petals 6 lines long, with broad claws as long or longer than the elliptic blade; style and stamens much exserted; bladder 3-horned, 1¼ to 2 inches long.

Cañon sides, 2000 to 4500 feet: Sierra Nevada from Siskiyou Co. to Tulare Co. May.

Field note.—On the South Fork Kaweah River bushes up to 12 feet high are frequent; at Big Spring on that fork an individual of unusual height (20 feet) was observed in 1911. The trunk was 1 inch in diameter at 2 feet above the ground and only slightly in excess of that diameter at the ground. The leaflets of sterile shoots are often 4 to 6 inches long. This species is sometimes called California Balloon Bush.

Locs.—Dunsmuir, *L. E. Smith;* McCormic bridge, Stanislaus River, *Blasdale;* Merced River near Grouse Creek, *Jepson* 8352; Pulpit Rock, Merced River, *Jepson* 3123; Fresno Flats, *Eastwood;* Auberry, Fresno Co., *Jepson* 12,954; Cedar Creek, North Fork Kaweah River, *Jepson* 601; betw. Clough Cave and Garfield Forest, South Fork Kaweah River, *Jepson* 4657.

Refs.—STAPHYLEA BOLANDERI Gray, Proc. Am. Acad. 10:69 (1874), type loc. McCloud River, Shasta Co., *Bolander;* Jepson, Fl. W. Mid. Cal. ed. 2, 251 (1911), Man. 611, fig. 609 (1925).

ACERACEAE. Maple Family

Deciduous trees or shrubs with opposite leaves. Flowers regular, polygamous or dioecious, borne in racemes, corymbs or fascicles. Calyx generally cleft into 5 segments, the petals as many or none. Stamens 3 to 10, borne on the edge of a disk or hypogynous. Pistil 1 with a 2-lobed 2-celled ovary and 2 styles. Ovary superior, developing a long wing from the summit of each lobe and thus ripening into a double samara; samaras separable at maturity, the wings serving to rotate them rapidly in the air and further their horizontal flight when carried away by the wind.—Genera 2, species 121, northern hemisphere.

Bibliog.—Pax, F., Aceraceae in Engler & Prantl, Pflr. 4^{163}:1–89, figs. 1–14, tt. 1–2 (1902). Greene, E. L., Some Californian Maples (Lflts. 2:248–254,—1912). Plowman, A. B., Is the Box Elder a Maple? (Bot. Gaz. 60:169–192, pls. 5–10,—1915).

1. ACER L. Maple

Leaves simple or pinnate. Flowers small, the clusters always drooping.—Species 120, North America, Europe, Asia, and 1 species in northwest Africa. (Ancient Latin name of the Maple tree.)

Leaves simple; flowers polygamous; petals present.
  Flowers in racemes; samaras more or less hispid; leaf-blades large, deeply 5-lobed............... 1. *A. macrophyllum.*
  Flowers in corymbs; samaras glabrous.
    Leaf-blades shallowly but acutely 7 to 9-lobed; sepals nearly twice as long as the petals. 2. *A. circinatum.*
    Leaf-blades mostly 3-lobed or -parted; sepals equaling petals....................3. *A. glabrum.*
Leaves pinnately or ternately compound; flowers dioecious; petals none....................4. *A. negundo.*

1. **A. macrophyllum** Pursh. Big-leaf Maple. Broad-crowned tree 30 to 95 feet high; leaf-blades roundish in outline, palmately parted into 5 broad fingers, 4 to 13½ inches wide; perfect and staminate flowers mixed in the same raceme; stamens 7 to 9, villous below; body of samara short-bristly, golden at maturity.

Banks of living streams, deep cañons, valley flats and moist hill slopes, 5 to 5000 feet: mostly throughout cismontane California, though absent from the plains of the Great Valley. North to Alaska. Mar.-Apr.

Locs.—S. Cal.: Hot Springs valley, n. San Diego Co. (Sargent, Silva 2:90); Claymine Cañon, Santa Ana Mts., *J. T. Howell* 2839; Mill Creek Cañon, San Bernardino Mts., *Jepson;* Altadena, *C. E. Hutchinson;* Mt. Wilson, *Peirson* 107a; Rock Creek, San Gabriel Mts., *Peirson* 107; Topango Cañon, Santa Monica Mts., *Epling & Ellison;* Horn Cañon, Ojai, *Olive Thacher;* San Marcos Pass, Santa Inez Mts., *Jepson.* Coast Ranges: Santa Margarita, *Condit;* Santa Lucia Creek, Santa Lucia Mts., *Jepson* 4728; Boulder Creek, Santa Cruz Co., *H. A. Walker* 754; Saratoga, Santa Clara Co., *Davy* 290; Niles, *Jepson;* Mt. Diablo, *Jepson;* Las Trampas Creek, Contra Costa Co., *Jepson* 6853a; Ross Valley, Marin Co., *Jepson* 1192a; Twin Sisters Peak, w. Solano Co., *Jepson* 2390; St. Helena, *Jepson;* Miller Cañon, Vaca Mts., *Jepson;* Cache Creek Cañon, w. Yolo Co., *C. F. Baker* 2981; South Mill Creek, Ukiah, *Jepson* 2421; Walker Valley, cent. Mendocino Co., *Jepson;* Mail Ridge, Humboldt Co., *Jepson* 1887; Bull Creek, Humboldt Co., *Jepson* 16,448; Elk Prairie, Humboldt Co., *Davy* 5435; Hupa Valley, *Goddard;* Shasta Sprs., *Jepson;* Shackelford Cañon, w. Siskiyou Co., *Jepson;* Humbug, Siskiyou Co., *Butler* 767; Cottage Grove, Klamath River, *Jepson;* Quartz Creek, Del Norte Co., *Jepson.* Sierra Nevada: Cedar Creek, North Fork Kaweah River, *Jepson* 609; Greeley Hill, Mariposa Co., *Jepson;* Yosemite, *Jepson;* Hetch-Hetchy, *Jepson;* Yankee Hill, Tuolumne Co., *A. L. Grant* 638; Indian Creek, Calaveras Co., *Drew;* Bear Valley, Nevada Co., *Jepson* 13,938; Rich Pt., Feather River, *Jepson;* Berry Creek, Butte Co., *Jepson;* Belden, Plumas Co., *Jepson;* Cow Creek, Shasta Co., *M. S. Baker.*

Refs.—Acer macrophyllum Pursh, Fl. 267 (1814), type loc. Columbia River rapids, *Lewis;* Nutt. Sylva 2:24, pl. 67 (1865); Jepson, Fl. W. Mid. Cal. 252 (1901), ed. 2, 250 (1911), Silva 264, pl. 80, figs. 1–2 (1910), Man. 611, fig. 610 (1925). Var. *brevialatum* O. Ktze. Rev. Gen. Pl. 1:146 (1891), type from Cal., wings short and broad. Var. *imbricatum* O. Ktze. l.c., type from Cal., wings erect, in part overlapping. The following slight forms are in part ecological: *A. flabellatum* Greene, Lflts. 2:249 (1912), type from n. Cal., Wilkes Exped. *A. coptophyllum* Greene, l.c. 250, type from Humboldt Co., *C. C. Marshall.* *A. platypterum* Greene, l.c., type loc. Round Valley, Mendocino Co., *Chesnut.* *A. auritum* Greene, l.c. 251, based on Putah Cañon, e. Napa Co., *Brewer* 1316, and Calistoga, Napa Valley, *Pringle.* *A. stellatum* Greene, l.c. 252, type loc. Cache Creek Cañon, Yolo Co., *C. F. Baker* 2981. *A hemionitis* Greene, l.c. type loc. Tassajara Hot Sprs., Monterey Co., *Elmer* 3179. *A. dactylophyllum* Greene, l.c. 253, type loc. San Bernardino Mts., *Parish.* *A. leptodactylon* Greene, l.c., type loc. Sulphur Mt., Ventura Co., *Abrams & McGregor.* *A. politum* Greene, l.c. 254, type loc. Johnson Creek, Fort Tejon, Kern Co., *Coville & Funston* 1166.

2. **A. circinatum** Pursh. Vine Maple. Shrub or sometimes a small tree, erect and 5 to 20 feet high, but more often vine-like or reclining; leaf-blades 2 to 4 inches broad, 5 to 7-lobed to the middle, with toothed margin; flowers 4 to 10 or more in a corymb, most of them staminate, the cluster often setting but one fruit; stamens 6 to 10, shorter than the petals in the perfect flower but longer than the petals in the staminate flower; filaments villous below; samaras glabrous, the wings spreading at right angles to the stalk, scarlet when full grown; as the fruit ripens, the peduncle turns upward and finally the samara stands erect above the leaf.

Moist valley bottoms or along stream borders, 200 to 5000 feet: Mendocino Co. to Shasta and Del Norte Cos. North to Alaska. Apr.-May.

Locs.—Longvale, Mendocino Co., acc. *M. S. Baker;* White Thorn Valley, sw. Humboldt Co., *Tracy* 4999; South Yager Creek, Humboldt Co., *Tracy* 6061; Blue Lake, Humboldt Co., *Blasdale;* Devils Backbone, betw. Trinity Summit and Salmon Summit, *Jepson;* Hurdy Gurdy Creek, Del Norte Co., *M. S. Baker* 293; Shasta Sprs., *Jepson* 13,942; upper Clover Creek, near Stevens, Shasta Co., *M. S. Baker* 402; Bear Valley Mts., Shasta Co., *M. S. Baker.*

Refs.—ACER CIRCINATUM Pursh, Fl. 267 (1814), type loc. Columbia River rapids, *Lewis;* Jepson, Silva 267, pl. 80, figs. 5–6 (1910), Man. 611, fig. 611 (1925).

3. **A. glabrum** Torr. SIERRA MAPLE. Shrub 5 to 10 (or 14) feet high, with slender branchlets; leaf-blades 1 to 3 inches broad, palmately 3-lobed or often with 2 supplementary lobes at base, the margin unequally serrate; flowers 4 to 9, in loose umbel-like corymbs, the staminate without rudiments of pistils and the pistillate with short stamens; corymbs unisexual or with both pistillate and staminate flowers, the sexes often borne on different shrubs; stamens 7 to 10, glabrous; samaras usually several in a cluster, glabrous, the wings ascending.

Rocky or wet mountain slopes, 6000 to 9000 feet: San Jacinto Mts.; San Bernardino Mts.; desert ranges in Inyo Co.; Sierra Nevada; Humboldt Co. to Siskiyou Co. North to Alaska, east to the Rocky Mts. June-July.

Geog. note.—In the Southern California mountains, in the desert ranges and in the Sierra Nevada area Acer glabrum occurs in scattered and infrequent colonies, for the most part consisting of only a few individuals, though occasionally better developed on moist slopes in the Sierra Nevada. In western Siskiyou County it assumes a different role. From Marble Mountain to the region of Cuddihy Valley it is a frequent species in the high brush association, while on both slopes of the Siskiyou Mountains it is common in moist hollows and often abundant at the higher altitudes. It is also called Blood Maple.

Locs.—S. Cal. mts.: Tamarack Valley, San Jacinto Mts., *Hall* 2602; Mill Creek Falls, San Bernardino Mts., *Parish* 2510; Mt. San Bernardino, *J. Grinnell.* Inyo Co.: Telescope Peak, Panamint Range, *Jepson;* Grapevine Mts. (Contrib. U. S. Nat. Herb. 4:81). Sierra Nevada: Whitney Creek, Mt. Whitney, *Jepson;* Kern-Kaweah River, *Jepson;* Atwell Mill, East Fork Kaweah River, *Jepson;* Bubbs Creek, Fresno Co., *Jepson* 805; Illilouette Trail, Yosemite, *Jepson* 5676; Stubblefield Cañon, Tuolumne Co., *Jepson* 4532; Cascade Creek, upper Stanislaus River, *Jepson* 6529; Glen Alpine, Eldorado Co., *Ottley* 791; King Creek, Lassen Co., *Jepson;* Gold Run, Susanville, *Jepson.* North Coast Ranges: Trinity Summit, *Davy* 5780; Bear Creek, Trinity Co., *H. S. Yates* 476; Grizzly Creek, Trinity Co., *Alexander & Kellogg;* Marble Mt., *Jepson* 2837; Cuddihy Valley, w. Siskiyou Co., *Jepson.*

Refs.—ACER GLABRUM Torr. Ann. Lyc. N. Y. 2:172 (1828), type collected by *Edwin James* in the "Rocky Mts."; Jepson, Silva 268, pl. 80, figs. 3–4 (1910), Man. 612, fig. 612 (1925).

4. **A. negundo** L. var. **californicum** Sarg. BOX ELDER. Tree 20 to 60 feet high; leaves pinnately 3-foliolate, the leaflets 1¼ to 5 inches long, serrate and incised, or deeply 2 or 3-lobed, or the lobes sometimes becoming distinct and petioluled so that one or more of the primary leaflets is replaced by 2 or 3; staminate flowers clustered on thread-like hairy pedicels, the stamens 4 or 5; pistillate flowers borne in slender racemes; samaras straw-white, crimson when young, finely pubescent.

Along streams and in low moist valley bottoms, 5 to 5200 feet: mountains of coastal Southern California; Coast Ranges; Sacramento Valley. Mar.-Apr.

Locs.—S. Cal.: Santa Rosa Mts., *Clary* 1157; Pipe Creek, San Jacinto Mts., *Munz* 5804; Edgar Cañon, San Bernardino Mts., *Parish* 4148; Yucaipa, San Bernardino Mts. (Zoe 4:341); Santa Barbara, *Dunn.* Tehachapi Mts.: Canada de las Uvas (Contrib. U. S. Nat. Herb. 4:81). Coast Ranges: Arroyo Grande, San Luis Obispo Co., *Brewer* 433; Nacimiento River, Monterey Co., *Brewer* 536; Santa Cruz, *Jepson* 2256; Bradley, Salinas Valley, *J. T. Howell* 3006; Pescadero, San Mateo Co., *Jepson;* San Leandro Creek, Alameda Co., *Jepson;* Walnut Creek, Contra Costa Co., *Jepson* 3084; San Anselmo, Marin Co., *Jepson* 8263; Olema, Marin Co., *Jepson* 4032; Duncans Mills, Sonoma Co., *Davy* 1656; Putah Cañon, *Jepson;* Ukiah, *Jepson* 4007; Yreka Creek, Siskiyou Co., *Butler* 1617. Great Valley: Walnut Grove (Erythea 1:242); Harding Ldg., Sutter Co., *Jepson* 13,937.

Refs.—ACER NEGUNDO L. Sp. Pl. 1056 (1753), type from Va. Var. CALIFORNICUM Sarg. Gard. and For. 4:148 (1891), Silva 2:112, t. 97 (1891); Jepson, Fl. W. Mid. Cal. 252 (1901), ed. 2, 250 (1911), Silva 269, pl. 80, figs. 7–8, and pl. 81 (1910), Man. 612, fig. 613 (1925). *Negundo californicum* T. & G. Fl. 1:250 (1838), type from Cal., *Douglas;* H. & A. Bot. Beech. 327, t. 77 (1838); Nutt. Sylva, ed. 2, 2:37, t. 72 (1865).

SAPINDACEAE. Buckeye Family

Deciduous trees or shrubs with opposite palmately compound leaves and slightly irregular flowers. Ovary superior, 3-celled with 2 ovules in each cell, commonly but one ovule maturing.—Genera 122, species 1065, all continents, chiefly tropical.

Bibliog.—Spach, E., Generum et specierum Hippocastanearum revisio (Ann. Sci. Nat. ser. 2, 2:50–64,—1834). Nuttall, Thos., California Horse-Chestnut (Silva N. Am. 2:16–17, pl. 64,—1865).

1. AESCULUS L. Horse Chestnut

Flowers showy, ill-scented, on jointed pedicels in a terminal cylindrical thyrse, of two sorts, perfect (fertile) with long thick styles and sterile with short styles; fertile flowers few near top of thyrse. Calyx tubular, unequally 5-cleft. Petals 4 or 5, slightly unequal, clawed. Stamens 5 to 7, becoming successively much exserted and often unequal. Fruit a large 3-valved capsule releasing one large polished seed.—Species 14, North America, Europe and Asia, temperate. (Latin name of an Italian oak with edible acorns.)

1. **A. californica** Nutt. California Buckeye. Low broad-headed tree 10 to 20 (or 30) feet high; leaflets 5 to 7, oblong-lanceolate to oblong-elliptic, acute or acuminate, 3 to 5 inches long; thyrse 4 to 6 inches long; petals 6 to 7 lines long; axis of the thyrse at length naked and pendulous, bearing one pear-like pod or sometimes 2 to 9; seed 1 to 2 inches in diameter.

Foothill country, inhabiting protected hollows or slopes or moister areas in the dry hills, cañon bottoms, stream borders or rich valley flats: Coast Ranges (5 to 2500 feet) from Siskiyou Co. to San Luis Obispo Co. and thence south to northern Los Angeles Co.; Sacramento Valley; Sierra Nevada foothills (1000 to 5500 feet) from Shasta Co. to Kern Co. May-Aug.

Geog. note.—Aesculus californica is, after Quercus douglasii H. & A., the most common tree in the true foothills of California, although its extreme range is greater than that species. It is also a widespread tree in the coastal country. Growing close to the sea, as near Salmon Creek, Santa Lucia Mts., at Gazos Creek on the San Mateo coast, or at Capetown near Cape Mendocino, it ranges eastward to the Sierra Nevada foothills. In all the driest hill regions it is, however, absent, as also on the arid plains of the Great Valley, but it is usually found in the hills wherever habitats afford sufficient ground water. It often occurs as a shrub in the chaparral (as in the Vaca Mts. or on the forks of the Kaweah River), ascending the gullies on north slopes and spreading out into small fans at their head. In the Redwood belt, as along the upper South Fork of the Eel River, small colonies are found in open or semi-open country at the bases of the hills. In the interior South Coast Ranges, as on the North Fork of Lewis Creek, San Benito Co., it is uncommon and becomes less frequent southward. In the southern Sierra Nevada it keeps to the outer foothill ridges and westerly slopes, and does not invade interior mountain valleys, even where these offer a favorable altitude.

Biol. note.—The leaf habits, flowering period, and geographic distribution and geographic relationships of Aesculus californica indicate that it is a Pleistocene relic which has gradually adapted itself to the more arid conditions of present day climate in the foothills. The tree comes into leaf in March; by June or early July, on the average, the foliage in most localities away from the coast turns brown under the influence of the high dry season temperatures and intense insolation, a process which is rapid in spite of some protection afforded by conduplication of the leaflets. The leaves fall on turning brown, or they may persist for many weeks, but in any case they cease to function. Usually the leaflets fall separately and in advance of the now deflexed petioles. Just before the leaves complete their cycle the whole tree is crowned with hundreds of heavy panicles of flowers, making it one of the most showy of western arboreous species. Commonly but one or sometimes two of the terminal flowers set fruits, though occasionally one sees as many as 13 chestnuts in a cluster. In starvation years the chestnuts may be eaten by cattle and sometimes cause their death. This is due most probably to the powerful astringency of the fruits in closing the intestinal tract. In the southern Sierra Nevada foothills the wood as used for fence posts is considered more durable than the wood of Sequoia gigantea. Trees of rich moist bottoms have some capacity for regeneration after losing the crown. A trunk observed in 1900 at Inverness, Marin Co., was 23 feet in circumference and somewhat hollow; it bore 22 new shoots which were 4 to 6 inches in diameter.

Locs.—Coast Ranges: Castle Rock sta., upper Sacramento River, *Jepson;* Trinity River at South Fork, *Jepson;* Hydesville, *Tracy* 1246; Petrolia, *Jepson;* Williams Creek forks, ne. Mendocino Co., *Jepson;* Longvale, Mendocino Co., *Jepson;* betw. Stanley ridge and Cahto, *Jepson;* Mt. Sanhedrin, *Jepson;* Houghs Sprs., ne. Lake Co., *Jepson;* Lower Lake, Lake Co., *Ruth Ruddock;* Hopland, *Jepson;* Cloverdale, *Jepson;* Napa Range, *Jepson;* Vacaville, *Jepson* 13,935; Benicia Hills, *Jepson;* Mt. Diablo, *Jepson* 7616; Walnut Creek, *Jepson;* Berkeley, *Jepson* 8196; Lake San Andreas, San Mateo Co., *Jepson;* Pacheco Pass, *Jepson;* Arroyo Seco, Santa Lucia Mts., *Jepson;* Lorenzo Creek, San Benito River, *Jepson;* North Fork Lewis Creek, San Benito Co., *Jepson;* Gaunt ranch, Waltham Creek, sw. Fresno Co., *Jepson.* Tehachapi Mts.: Rowen, *Jepson;* Bear Mt., *Jepson;* Tejon Pass. Sacramento Valley: Crane Creek, w. Tehama Co., *Jepson;* betw. Elmira and Vacaville, *Jepson;* lower Sacramento River islands (Erythea 1:246). Sierra Nevada: Morley sta., Shasta Co., *M. S. Baker;* Little Chico Creek, *R. M. Austin;* Pents, Butte Co., *Heller* 10,756; San Andreas, *E. K. Crum;* Coulterville, *Jepson;* El Portal, Merced River, *Jepson;* Fish Creek, San Joaquin River, *Jepson;* Auberry (slope e.), Fresno Co., *Jepson;* Lime Kiln Creek, Tulare Co., *Jepson;* Clough Cave, South Fork Kaweah River, *Jepson* (often making 40 per cent of the stand on north and east slopes); North Fork Tule River, *Jepson;* Havilah, Kern Co. (Contrib. U. S. Nat. Herb. 4:80). Los Angeles and Santa Barbara Cos.: Oakgrove Cañon, Liebre Mts., *Munz* 6939; Kings Cañon, Sawmill Mt. (Erythea 3:156); Antelope Valley, *Parish* 1893; Matilija Creek (Sudworth, Trees Pac. Slope 400).

Refs.—AESCULUS CALIFORNICA Nutt.; T. & G. Fl. 1:251 (1838); Jepson, Fl. W. Mid. Cal. 251 (1901), ed. 2, 251 (1911), Silva 262, pl. 79 (1910), Trees Cal. ed. 2, 126, figs. 72–78,—1923; Man. 613, fig. 614 (1925); Peirce, G. J., Am. Jour. Bot. 21:215 (1934), the sap current and the vascular bundles in relation to the seasonal factors. *Calothyrsus californica* Spach, Ann. Sci. Nat. ser. 2, 2:62 (1834), type from Cal., *Botta. Hippocastanum californicum* Greene, Man. Reg. S. F. Bay 73 (1894).

RHAMNACEAE. BUCKTHORN FAMILY

Shrubs or small trees with simple leaves and mostly caducous stipules. Flowers small (½ to 1½ lines long), regular, commonly in little umbels, the umbels often aggregated in racemes or panicles. Calyx-lobes, petals and stamens 5 (or 4). Calyx-tube lined with a disk, the petals and stamens inserted on the edge of the disk and alternate with the calyx-lobes. Petals hooded, commonly clawed, sometimes wanting. Ovary 3 (or 2)-celled, free from or adnate by the disk to the base of the calyx; ovules 1 in each cell, or 1 or 2 in Condalia. Style simple or 3-cleft. Fruit in ours a berry-like drupe or a capsule.—Genera 45, species about 500, all continents.

Leaf persistence.—The biological relations of the leaves (in Californian Rhamnaceae) to climatic and seasonal factors are not well known, but most species are evergreen. Rhamnus purshiana and alnifolia are deciduous but our other Rhamni are evergreen. All our Ceanothi are evergreen save that Ceanothus sanguineus is wholly deciduous and that C. integerrimus usually becomes largely bereft of leaves by midwinter as also does C. parryi. In the case of Adolphia californica, a shrub of arid regions, the leaves fall soon after the period of anthesis in February or March. The leaf habits of our species of Condalia and Colubrina have yet to be studied.

Bibliog.—Watson, S., Revision of the genus Ceanothus (Proc. Am. Acad. 10:333–339,—1875). Greene, E. L., [Notes on] Ceanothus (Bull. Cal. Acad. 1:80–81,—1885); Some western buckthorns (Lflts. 1:63–65,—1904); New species of Ceanothus (Lflts. 1:65–68,—1904). Parry, C. C., Ceanothus L., a synoptical list (Proc. Davenp. Acad. 5:162–176,—1889); Ceanothus L., recent field notes (l.c. 5:185–194,—1889). Trelease, W., Synoptical list of N. Am. species of Ceanothus (Proc. Cal. Acad. ser 2, 1:106–118,—1888); N. Am. Rhamnaceae (Trans. St. Louis Acad. Sci. 5:358–369,—1889). Brandegee, K., Rhamnus californica and its allies (Zoe 1:240–244,—1890); Studies in Ceanothus (Proc. Cal. Acad. ser. 2, 4:173–222,—1894). Pammel, L. H., The species of Rhamnus in sw. U. S. and the Pacific Coast (Iowa Acad. Sci. 29:267–270,—1922). McMinn, H. E., A geographic and taxonomic study of the Californian species of the genus Ceanothus (Contrib. Dudley Herb. 1:121–147, pl. 10,—1930).

Fruit drupe-like; calyx-lobes, petals and stamens 4 or 5; calyx or its lower portion persistent as a collar beneath the fruit.
  Drupe with 1 nutlet; petals hooded and clawed or none; calyx-lobes deciduous or persistent; spinose desert shrubs……1. CONDALIA.
  Drupe berry-like with 2 or 3 nutlets; petals not hooded or clawed, or none; calyx-tube circumscissile near middle, the upper portion of tube and lobes deciduous as one piece, the lower portion persistent; chiefly spineless cismontane shrubs……2. RHAMNUS.

Fruit a capsule; calyx-lobes, petals and stamens 5; petals clawed.
  Calyx-tube joined to base of ovary, its lobes at length deciduous; style not jointed; leaves present.
    Calyx-lobes colored; widespread chiefly cismontane or montane shrubs......3. CEANOTHUS.
    Calyx-lobes herbaceous; rare and local desert shrub......4. COLUBRINA.
  Calyx-tube free from ovary, its lobes persistent in fruit; style jointed; leaves caducous (thus commonly absent)......5. ADOLPHIA.

1. **CONDALIA** Cav.

Ours shrubs with divaricate mostly spiny twigs. Leaves alternate, entire, with minute stipules. Flowers in small axillary umbels, sometimes reduced to a single flower, sometimes developed into small panicles. Calyx deeply 5-lobed. Petals present or none. Ovary free from the calyx and annular disk, incompletely 2-celled, with 1 or 2 placentae and 1 or 2 ovules. Fruit drupaceous, the style-base persisting.—Species 10, North and South America. (A. Condal, Spanish physician.)

Petals present; calyx deciduous; ovary with 2 placentae.
  Umbels or panicles peduncled; branches and spines puberulent......1. *C. lycioides.*
  Umbels sessile; branches and spines glabrous......2. *C. parryi.*
Petals none; calyx persistent; ovary with 1 placenta......3. *C. spathulata.*

1. **C. lycioides** Weberb. WHITE CRUCILLO. (Fig. 226.) Straggly branching shrub commonly 4 to 7 feet high, the branches regularly armed with rigid slender often leafless spines ¾ to 2¼ inches long; branches and spines whitened and puberulent, the flower-bearing branchlets and the calyces finely tomentose; shrub commonly leafless, the leaves when present with narrowly elliptic blades 4 to 7 lines long, very shortly petioled; flowers minute (about 1 line broad); drupe subglobose or somewhat elongated, 4 lines long.

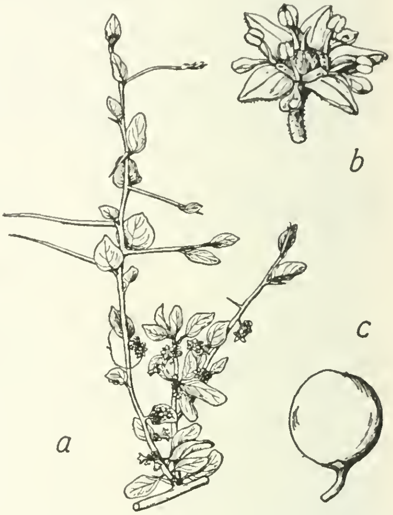

Fig. 226. CONDALIA LYCIOIDES Weberb. *a*, flowering branchlet, × ½; *b*, fl., × 5; *c*, fr., × 1½.

Arid hills, 50 to 2600 feet: hills on north side of Colorado Desert. East to Texas, south to Mexico. Jan.

Habit note.—In the Cottonwood Mts. Condalia lycioides is commonly an erect shrub about 4 to 6 feet high. At the Cottonwood Spring a very large individual was observed in 1928; its crown was 12 feet high and, resting on the ground, had a spread of 24 feet.

Locs.—Cottonwood Spr., Cottonwood Mts. (n. of Mecca), *Jepson* 12,614; Mammoth Tank (Syn. Fl. 1^1:403); Chuckwalla Bench, *Schellenger* 64; Aztec Well, Chuckwalla Mts., *L. J. Childs;* Purple Hills Pass, Colorado River, *Jepson* 5295.

Refs.—CONDALIA LYCIOIDES Weberb.; Engler & Prantl, Nat. Pflzfam. 3^5:404 (1895). *Zizyphus lycioides* Gray, Jour. Bost. Soc. Nat. Hist. 6:168 (1850), type loc. betw. Matamoros and Zapimi, Mex., *Gregg. Z. lycioides* var. *canescens* Gray; Rothrock, Bot. Wheeler 82 (1878), type loc. Gila River valley, Ariz., *Rothrock* 331.

2. **C. parryi** Weberb. CALIFORNIA LOTE BUSH. Glabrous shrub 6 to 10 feet high with flexuous branches and slender spines; branches and spines grayish or reddish-brown; leaves mostly fascicled on short spurs, the blades obovate to elliptical, 4 to 8 lines long, on petioles 1 to 3 lines long; drupe elliptic to oblong, 6 to 7 lines long, shortly beaked, borne on a slender pedicel 4 to 5 lines long.

Dry cañons and mesas, 1000 to 2500 feet: mountains on north and west sides of the Colorado Desert. South to Lower California. Apr.

Locs.—Piñon Well grade, Conchilla Range, *Jepson* 5993; Morongo Valley, *Jepson* 12,641; Palm Cañon of San Jacinto, *Jepson* 1337; Stuart Spr., Grapevine Cañon, e. San Diego Co., *Jepson* 8763; lower San Felipe Valley, *Jepson* 8728; Mason Valley, e. San Diego Co., *Jepson* 8641; Banner, *T. Brandegee;* Jacumba, e. San Diego Co., *Cleveland.*

Refs.—CONDALIA PARRYI Weberb.; Engler & Prantl, Nat. Pflzfam. 3^{5}:404 (1895); Jepson, Man. 613 (1925). *Zizyphus parryi* Torr. Bot. Mex. Bound. 46 (1859), type loc. San Felipe, e. San Diego Co., *Parry;* Kellogg, Pac. Rur. Press 32:489 (1886).

3. **C. spathulata** Gray. MEXICAN CRUCILLO. Shrub, intricately branched, the branchlets rigid, spinescent, leafy; herbage puberulent; leaf-blades obovate or spatulate, 2 to 3 lines long, narrowed to short petioles, the under side with a few broad light-colored veins in relief; umbels sessile, 1 or 2-flowered; pedicels 1 line long; drupe ovoid, 2 lines long.

Sandy mesas, 50 to 800 feet: eastern Colorado Desert. East to Texas, south to Mexico. July.

Loc.—Mesquite sta. (Syn. Fl. 1^{1}:403), the only station known in California.

Refs.—CONDALIA SPATHULATA Gray, Pl. Wright. 1:32 (1852), 2:27 (1853), type loc. "Rio Grande, Texas, and prairies on the San Felipe", *Wright;* Jepson, Man. 614 (1925).

2. **RHAMNUS** L. BUCKTHORN

Shrubs with alternate leaves. Flowers greenish, perfect or polygamous. Umbels axillary, sessile or peduncled. Calyx with 4 or 5 lobes or teeth, its tube after anthesis circumscissile near the middle, the upper portion of tube and the lobes deciduous as one piece, the lower portion persistent as a narrow collar beneath the fruit. Petals very small, hooded and without claws, or none. Stamens 4 or 5; filaments short. Ovary ovoid, free. Fruit berry-like, containing 2 or 3 separate seed-like nutlets of bony or cartilaginous texture.—Species about 120, all continents. (The ancient Greek name.)

Berry black.
  Foliage evergreen; petals present; leaves ¾ to 3 inches long.
    Leaves thickish; bark of branchlets gray or brown; petals when spread out somewhat obcordate, sub-acute at base........1. *R. californica.*
    Leaves thinnish; bark of branchlets cherry-red; petals when spread out somewhat rhomboidal, notched at apex, truncatish at base........2. *R. rubra.*
  Foliage deciduous; leaves thinnish.
    Petals present; leaves 3 to 8 inches long........3. *R. purshiana.*
    Petals none; leaves 1 to 2½ inches long........4. *R. alnifolia.*
Berry red; petals none or very minute; foliage evergreen........5. *R. crocea.*

1. **R. californica** Esch. CALIFORNIA COFFEE-BERRY. Shrub commonly 4 to 6 feet high; leaves scattered along the branchlets, the blades narrowly or broadly oblong, serrulate, usually acute, glabrous or slightly puberulent, dark green when dried, 1½ to 2½ inches long; flowers mostly 5-merous; peduncles 1 to 10 lines long; berry green when young, turning red or reddish and finally black when ripe, globose or oval, 3 to 4 lines in diameter, containing 2 (rarely 3) nutlets.

Dry flats, moist hillslopes or rocky ridges, 50 to 5500 feet: Coast Ranges from Trinity and Humboldt Cos. to San Luis Obispo Co.; Santa Barbara Co. to the Santa Monica, San Gabriel, San Bernardino and San Jacinto mountains. East to Arizona, south to Lower California. Mar.-Apr. It is also called Pigeon Berry and Yerba del Oso.

Note on variation.—In leaf form Rhamnus californica is extremely variable. Narrow or broad pointed leaf-blades either long or short, broad leaf-blades with acute or very rounded apices, may be had from shrubs in the San Francisco Bay region which are otherwise alike in habit, flowers and fruit. On the other hand distinctive leaf forms are often associated with local climatic areas. In arid habitats, the leaf-blades are often small and thick, in shady situations they become thin and enlarged (4 to 6 inches in length). All of the named varieties as described below vary in foliage to a similar degree, and all, except perhaps the last one, pass into each other by intergrades where the ranges overlap or meet.

Locs.—Coast Ranges: Bluff Creek, Klamath River, n. Humboldt Co., *Chandler* 1453; Kneeland Prairie, Humboldt Co., *Tracy* 3037; Martins ranch, South Fork Trinity River, *Jepson* 2001; Grasshopper Peak, Humboldt Co., *Jepson* 16,480; Briceland, s. Humboldt Co., *Jepson* 2206; Leggett Valley, nw. Mendocino Co., *Jepson* 9478; Willits, Mendocino Co., *Jepson* 9425; Mill Creek ranger sta., n. Lake Co., *Heller* 13,246; Miller Cañon, Vaca Mts., *Jepson* 13,972; Tomales Bay, Marin Co., *Jepson* 2462; Berkeley, *Jepson* 5624; Oakland Hills, *Jepson* 6813; Mt. Diablo, *M. S. Baker;* Mountain Lake, San Francisco, *Jepson* 13,976; Black Mt., Santa Clara Co., *C. F. Baker* 1706; Monterey, *Brewer* 639; San Luis Obispo, *Elmer Awl.* S. Cal.: San Marcos Pass, Santa Inez Mts., *Jepson* 12,140; Santa Barbara, *Dunn;* Ojai Valley, Ventura Co., *S. F. Peckham;* Santa Monica, *Davy* 2727; Mt. Wilson, *C. E. Hutchinson;* Rubio Cañon, San Gabriel Mts., *Peirson* 108; Waterman Cañon, San Bernardino Mts., *Parish* 11,409; Strawberry Valley, San Jacinto Mts., *Jepson* 2265.

Var. **tomentella** B. & W. Gray Coffee-berry. Leaf-blades 2 to 3 inches long, elongated, oblong, varying to elliptic, obscurely serrulate or entire, abruptly acute or acuminate, usually conspicuously feather-veined, finely tomentose on the under side or even silvery, typically very olive-like; peduncles ½ to 1¼ inches long.—Dry foothills, 500 to 5000 feet: Sierra Nevada foothills from Shasta Co. to Kern Co.; inner Coast Ranges from Tehama Co. to western Fresno Co.; Mohave Desert; south to coastal Southern California. Far south to Lower California.

Locs.—Sierra Nevada foothills: Olinda, Shasta Co., *Blankinship;* Little Chico Creek, Butte Co., *R. M. Austin;* Oroville, *Heller* 10,753; Grass Valley, *Heller* 8104; Fair Oaks, Sacramento Co., *Ramaley* 11,250; Jackson, Amador Co., *Michener & Bioletti;* Angels Camp, Calaveras Co., *Jepson* 10,421; Columbia, Tuolumne Co., *Jepson* 6442; Knights Ferry, e. Stanislaus Co., *Sanford;* Coulterville, Mariposa Co., *Jepson* 13,981; Orosi, Tulare Co., *S. J. Brubaker;* Bodfish, Kern River, *W. P. Taylor.* Marysville Buttes: South Peak, *Jepson* 13,979. Coast Ranges: Red Bluff, *Boldenweek;* Cortina Valley, sw. Colusa Co., *Jepson* 16,746; Samuels Sprs., Napa Co., *Jepson* 13,980; Calaveras Valley, Alameda Co., *A. W. Sampson;* Greeninger Creek, w. of Gilroy, *Jepson* 9690; Lyon Creek, w. Fresno Co., *S. C. Lillis.* S. Cal.: Providence Mts., *T. Brandegee;* San Emigdio Cañon, sw. Kern Co., *Davy* 2030; Manzana, Antelope Valley, *Davy* 2536; Mt. Pinos, *J. Grinnell;* Rock Creek, San Gabriel Mts., *Peirson* 110; Santa Rosa Mts., *Munz* 5817; Henshaw Dam, Palomar Mt., *Wiggins* 3126; Warners ranch, e. San Diego Co., *Parish* 1424; betw. Campo and Buckman Sprs., San Diego Co., *J. T. Howell* 2976.

Var. **crassifolia** Jepson. Shrub 3 to 8 feet high; branchlets and petioles very stout; leaf blades oval or elliptic, obtusish at apex, or sometimes shortly acute, rounded or obscurely cordate at base, very thick and leathery, very prominently parallel-nerved beneath, 1½ to 3 inches long, 1 to nearly 2 inches wide, finely tomentulose below, microscopically so above; leaf-scars prominent.—Inner North Coast Range foothills from eastern Mendocino Co. and Colusa Co. to Tehama Co., in the chaparral: Covelo, ne. Mendocino Co., *W. P. Taylor;* Crum Hill, Leesville, Colusa Co., *J. D. Coffman;* Mud Flat, w. Glenn Co., *Heller* 11,534; Paskenta (w. of), *W. W. Mackie.*

Var. **occidentalis** Jepson. Foliage yellowish; leaf-blades oval or elliptic, obtuse or shortly acute, entire, 1½ to 2½ inches long, glabrous; peduncles 1 to 6 lines long.—Northern Humboldt Co., California, to Josephine Co., Oregon: betw. Three Creeks and Willow Creek, n. Humboldt Co., *Jepson* 1977; Red Hill, Del Norte Co., *Jepson* 2903; Gasquet, Del Norte Co., *M. S. Baker* 218. A well-marked local form.

Var. **viridula** Jepson. Leaf-blades obovate or oblong, obtuse or very shortly acute, ¾ to 1¼ inches long, dark green above, velvety beneath to the touch but scarcely to the eye; umbels sessile or shortly peduncled.—Desert slopes, Inyo Co., 7500 feet.

Refs.—RHAMNUS CALIFORNICA Esch. Mem. Acad. St. Petersb. ser. 6, 10:285 (1826), type loc. middle California coast, *Eschscholtz;* Curran, Proc. Cal. Acad. ser. 2, 1:252 (1888); Jepson, Fl. W. Mid. Cal. 254 (1901), ed. 2, 252 (1911), Man. 614, fig. 615 (1925). Var. TOMENTELLA B. & W. Bot. Cal. 1:101 (1876); Jepson, Fl. W. Mid. Cal. 254 (1901), ed. 2, 252 (1911), Man. 615 (1925). *R. tomentella* Benth. Pl. Hartw. 303 (1897), type loc. Sierra Nevada foothills, *Hartweg* 347, probably on the excursion along the Yuba River (cf. Erythea 5:55). *R. cuspidata* Greene, Lflts. 1:64 (1904), type loc. Tehachapi, *Greene.* Var. CRASSIFOLIA Jepson, Man. 615 (1925), type loc. Bear Valley (ridge w.), Colusa Co., *Jepson* 8974. Var. OCCIDENTALIS Jepson, Man. 615 (1925). *R. occidentalis* Howell, Pac. Coast Pl. Coll. 1887, type loc. Waldo, s. Ore., *Howell;* Greene, Pitt. 2:15 (1889). Var. VIRIDULA Jepson, Man. 615 (1925), (by printer's error "virida"), type loc. Cottonwood Creek, Inyo Co., *Jepson* 5086.

2. **R. rubra** Greene. Sierra Coffee-berry. Shrub 2 to 5 feet high, with reddish twigs; leaf-blades oblong, finely serrulate, pale or yellowish green, glabrous, ¾ to 1½ inches long; umbels sessile or nearly so; berries obovoid or somewhat contracted at base, 2 to 3 lines long.

Mountain slopes, 2200 to 7000 feet: Siskiyou Co.; Sierra Nevada from Shasta and Modoc Cos. to Fresno Co. June. The leaves are sometimes remarkably similar to the arid chaparral form of Prunus emarginata Walp.

Locs.—Mt. Eddy, Siskiyou Co., *Copeland* 3863; Dunsmuir, *Jepson* 6171; Upper Fall River Valley, *Jepson* 5774; Egg Lake, Modoc Co., *M. S. Baker;* betw. Fourteen-mile House and Forest Ranch, Butte Co., *Heller* 11,404; Engels, Light Creek, Plumas Co., *Jepson* 8004; Pioneer sta., Sierra Co., *Jepson* 16,846; Truckee, *Sonne* 343; Mt. Tallac, *Jepson* 8128; Huntington Lake, Fresno Co., *A. L. Grant* 1097.

Var. **obtusissima** Jepson comb. n. Leaf-blades elliptic or broadly oblong, very obtuse, serrulate, 1 to 1½ inches long, often puberulent beneath, slightly yellowish when dried; lateral veins many, disposed to be straightish; umbels disposed to be sessile; calyx-lobes with a prominent median ridge inside; anthers often with a black longitudinal band.—Sierra Nevada, 2500 to 6000 feet, north to Mt. Shasta, south to the San Bernardino Mts.

Locs.—Sierra Nevada: Castella, Shasta Co., *Rosenbaum;* Forestdale, sw. Modoc Co., *M. S. Baker;* Morgan Sprs., Tehama Co., *Jepson* 12,324; Fallen Leaf, Eldorado Co., *Ottley* 919; Calaveras Big Trees, *Davy* 1543; Yosemite Valley, *Jepson* 10,482; Kinsley, Mariposa Co., *Charlotte Hoak;* Clover Mdw., Soquel ridge, Madera Co., *Kennedy;* South Fork sta., Fresno Co., *K. Brandegee;* Mt. Moses, Tulare Co., *Purpus* 1446; Fay Creek, Weldon, Kern Co., *W. P. Taylor;* San Bernardino Mts., *Parish.* On the lower margins of its altitudinal range it passes into forms which are indistinguishable from R. californica, such as: Hetch-Hetchy, *Jepson* 3439; Yosemite, *Jepson* 5669.

Refs.—RHAMNUS RUBRA Greene, Pitt. 1:68, 160 (1887), type loc. Truckee, *Sonne;* Jepson, Man. 614 (1925). *R. californica* var. *rubra* Trel. Trans. St. Louis Acad. 5:367 (1889); Gray, Syn. Fl. 1^1:408 (1897). Var. OBTUSISSIMA Jepson. *R. obtusissima* Greene, Lflts. 1:64 (1904), type loc. Sisson, *Copeland* 3833. *R. californica* var. *obtusissima* Jepson, Man. 615 (1925).

3. **R. purshiana** DC. CASCARA SAGRADA. Small tree or shrub 8 to 20 feet high; leaves in a tuft at end of branchlets, deciduous, the blades thinnish, elliptic-oblong, obtuse or slightly cordate at base, obtuse or abruptly blunt-pointed at apex, serrulate, 2½ to 5 (or 8) inches long; petioles tomentulous; flowers 5-merous; berry black, with 3 (rarely 2) nutlets.

Mountain slopes and cañons, 50 to 5000 feet: near the coast from Mendocino Co. to Del Norte Co. North to Washington. May.

Locs.—Comptche, Mendocino Co., *Jepson* 2168; Laytonville, *Jepson* 13,965; Grouse Mt., Humboldt Co., *Tracy* 4847; Humboldt Bay, *Chandler* 1173; betw. Korbel and Angels ranch, n. Humboldt Co., *Jepson* 1932; betw. Mud Spr. and Trinity Summit, *Jepson* 2032; Rush Creek, Trinity Co., *H. S. Yates* 543; Marble Valley, Siskiyou Co., *Butler* 23; Crescent City, *Davy;* Smith River redwoods, *Jepson* 2906. Tamba Ranch, Chetco River, sw. Ore., *Jepson* 9368.

Var. **anonaefolia** Jepson. Leaf-blades obovate or oblong, the larger 4 to 7 inches long and 1¼ to 2½ inches wide, mostly cuneately tapering at base.—Montane, 4000 to 6000 feet: northern Sierra Nevada from Nevada Co. to Siskiyou Co.: Bear Valley, Nevada Co., *Jepson* 13,966; Sisson, Siskiyou Co., *Jepson* 13,967.

Refs.—RHAMNUS PURSHIANA DC. Prod. 2:25 (1825); Sargent, Silva N. Am. 2:37, tt. 62, 63 (1891); Jepson, Fl. W. Mid. Cal. 254 (1901), ed. 2, 251 (1911), Man. 614 (1925). *R. alnifolia* Pursh, Fl. 166 (1814), type loc. Kooskoosky River, *Lewis,* that is, Camp Chopunish, opp. Kamiah, Clearwater River, Ida. (cf. Contrib. U. S. Nat. Herb. 11:386); not R. alnifolia L'Her. (1788). Var. ANONAEFOLIA Jepson, Man. l.c. *R. anonaefolia* Greene, Pitt. 3:16 (1896), type loc. Placer Co., *A. M. Carpenter.*

4. **R. alnifolia** L'Her. DWARF BUCKTHORN. Low shrub (2 to 3 feet high); leaf-blades elliptic, acuminate, markedly serrulate, thin, glabrous, 1 to 2½ inches long, the petioles 2 lines long; flowers appearing with the leaves, in 1 to 3-flowered umbels sessile in the lower axils; pedicels 1 to 2 lines long; petals none; seeds cuneate-obovate, flat.

Montane swamps, 4500 to 6000 feet: Placer, Nevada and Sierra Cos. North to British Columbia, east to Maine. June.

Locs.—Betw. Truckee and Tahoe, *Sonne* 44; Donner Lake, *Heller* 6933; Sierra Co. (Bot. Cal. 1:100).

Refs.—RHAMNUS ALNIFOLIA L'Her. Sert. Ang. 5 (1788), "in America septentrionale"; Greene, Erythea 4:86 (1896).

5. **R. crocea** Nutt. RED-BERRY. Low densely branched glabrous shrub ½ to 2 or 3 feet high, the branchlets rigid or even spinescent; leaves often fascicled, the blades elliptic, firm-coriaceous, 1 to 5 (or 8) lines long, serrulate, green above, yellowish beneath, very shortly petioled; flowers mostly polygamous and 4-merous; petals none or minute; berry 2 to 3 lines long, red, containing 2 (rarely 3) nutlets.

Dry ridges and cañon sides, 50 to 3000 feet: Napa Co. and south near the coast to Santa Barbara and San Diego. South to Lower California. Mar.-Apr.

Locs.—Howell Mt., Napa Range, *Jepson* 6587; Mt. George (n. of), Napa Range, *Jepson* 13,970; Berkeley, *Davy* 833; Mission Hills, San Francisco, *Greene;* Stanford, *C. F. Baker* 609; Guadalupe Mine, Santa Clara Co., *Jepson* 9093; Monterey, *Brewer* 636; betw. Sans Mill and San Miguelito ranch, Santa Lucia Mts., *Jepson* 1678; San Luis Obispo, *Condit.* S. Cal.: Mission Cañon, Santa Barbara, *Eastwood;* Los Alisos Cañon, Santa Monica Mts., *Epling;* Arroyo Seco (foothills w.), San Gabriel Mts., *Peirson* 339; San Bernardino, *Parish;* San Jacinto, *Gregory;* betw. Cahuilla Valley and Aguanga, w. Riverside Co., *Jepson* 1481; Mt. Soledad, *Newlon* 335; San Diego, *M. F. Spencer* 134.

Var. **ilicifolia** Greene. Erect, often tree-like with a distinct trunk, or the stems several and clustered, 3 to 12 feet high; branchlets rather stout, repeatedly and shortly branched at the ends, making a twiggy or clumpy growth; leaf-blades oval to orbicular, often golden beneath, spinulose-dentate, 4 to 12 lines long; calyx-lobes and stamens 4 or often 5; berry bright red, ovoid, 2½ lines long.—Dry hills and cañon flats, 1000 to 4000 feet: inner Coast Ranges from Trinity Co. to San Luis Obispo Co.; Sierra Nevada from Shasta Co. to Kern Co.; coastal Southern California.

Locs.—Coast Ranges: Willow Creek, Trinity River valley, *Tracy* 5959; Cortina Valley, sw. Colusa Co., *C. J. Wilcomb;* Little River, Mendocino Co., *Bolander* 4806; Round Valley, ne. Mendocino Co., *Goddard* 233; Miller Cañon, Vaca Mts., *Jepson;* Twin Sisters Peak, Napa Range, *Jepson* 2389; Donner Cañon, Mt. Diablo, *Jepson* 7583; upper San Benito River at Lorenzo Creek, *Jepson* 12,231; Atascadero, San Luis Obispo Co., *Brewer* 510. Sierra Nevada: Goose Valley, Shasta Co., *Baker & Nutting;* Knights Ferry, e. Stanislaus Co., *F. W. Bancroft;* Hetch-Hetchy, *Chesnut & Drew;* Yosemite, *Abrams* 4488; Kinsley, Mariposa Co., *Charlotte Hoak;* Three Rivers, *Coville & Funston* 1299; Grouse Valley, Tulare Co., *Jepson* 4713; Fay Creek, Weldon, Kern Co., *W. P. Taylor.* S. Cal.: Providence Mts., *T. Brandegee;* Manzana, Antelope Valley, *Davy* 2541; Zaca Lake, Santa Barbara Co., *Condit;* Sespe Creek, Ventura Co., *Howland & Darsie;* Pine Cañon, w. of Elizabeth Lake, *J. R. Hall* 6h; Altadena, *C. E. Hutchinson;* Eaton Cañon, San Gabriel Mts., *Peirson* 109; Devils Punch Bowl, San Gabriel Mts., *Peirson* 287; Beaumont, Riverside Co., *Gilman;* Mt. San Jacinto, *C. V. Meyer* 164; Claymine Cañon, Santa Ana Mts., *Howell* 2824; Warner Hot Sprs., ne. San Diego Co., *J. A. Ream;* Banner Cañon, San Diego Co., *Chandler* 5458; Witch Creek, San Diego Co., *Alderson;* Campo, San Diego Co. (Bull. N. Y. Bot. Gard. 6:406).

Var. **insularis** Sarg. Tree 15 to 30 feet high; similar to var. ilicifolia; leaves less prominently or scarcely at all toothed; berries larger.—Santa Barbara Islands: Santa Catalina Isl., *Jepson* 3042; Santa Cruz Isl., *Jepson* 12,081.

Var. **pilosa** Trel. Leaves more or less puberulent or pilose.—Mountains of San Diego Co., both cismontane and transmontane: Ramona, *K. Brandegee;* San Diego, *Mary Spencer* 135.

Refs.—RHAMNUS CROCEA Nutt.; T. & G. Fl. N. Am. 1:261 (1838), type loc. Monterey, *Nuttall;* Curran, Proc. Cal. Acad. ser. 2, 1:251 (1888); Jepson, Fl. W. Mid. Cal. 254 (1901), ed. 2, 252 (1911), Man. 615, fig. 616 (1925). Var. ILICIFOLIA Greene, Fl. Fr. 79 (1891). *R. ilicifolia* Kell. Proc. Cal. Acad. 2:37 (1859), type loc. Clear Lake, Lake Co., *Veatch.* Var. INSULARIS Sarg. Gard. & For. 2:364 (1889), Silva N. Am. 2:34, t. 60 (1891). *R. insularis* Greene, Bull. Cal. Acad. 2:392 (1887), Pitt. 1:201 (1888). *R. pirifolia* Greene, Pitt. 3:15 (1896), type loc. Santa Cruz Isl., *Greene. R. catalinae* Dav. Bull. S. Cal. Acad. 16:47 (1917), type loc. Santa Catalina Isl., *Davidson* 2344. Var. PILOSA Trel.; Curran, Proc. Cal. Acad. ser. 2, 1:251 (1888), type loc. Santa Maria Valley, San Diego Co., *Palmer* 38. *R. pilosa* Abrams, Bull. Torr. Club 37:153 (1910), Bull. N. Y. Bot. Gard. 6:406 (1910).

3. CEANOTHUS L.

Shrubs or small trees with petioled leaves, the branchlets often divaricate and rigid, sometimes spinescent. Flowers small but showy, borne in panicles or umbels. Calyx 5-lobed, the lower part adnate with the thick disk to the lower part of the 3-celled ovary. Petals 5, hooded by the inflexion of the acuminate apex, and with long claws. Stamens 5, filaments filiform, long-exserted. Style 3-cleft. Capsule subglobose, 3-celled, 3-lobed, becoming dry and separating into its 3 carpels, these elastically dehiscent along the inner edge and dispersing the seeds. Seeds obovate, convex on the back.—Species about 40, North America. (Greek Keanothus, name used by Dioscorides to designate some spiny plant.)

Biol. note.—The roots of Ceanothus thyrsiflorus bear mycorrhizal nodules in abundance. Our first observation was made on Mt. Tamalpais in 1912. In the same year nodules were frequently found on the root system of Ceanothus foliosus. In all probability all other species of this genus develop such structures. Compare the illustrations of Ceanothus foliosus (fig. 227) and Ceanothus rigidus (fig. 237).

A. LEAVES ALTERNATE, ENTIRE OR IF NOT ENTIRE THE TEETH USUALLY GLANDULAR; STIPULES THIN, FUGACIOUS OR DECIDUOUS; FLOWERS IN SMALL UMBEL-LIKE CLUSTERS WHICH ARE RACEMOSELY DISPOSED ALONG A SIMPLE AXIS ("SIMPLE PANICLE") OR ALONG A MORE OR LESS BRANCHED AXIS ("COMPOUND PANICLE"); CAPSULES OFTEN RIDGED OR CRESTED ON BACK OF THE LOBES OR CELLS, NEVER WITH HORNS.—Subgenus EUCEANOTHUS.

1. Branchlets mostly flexible; spines none; bark green or brown.

Panicles mostly simple; flowers blue, mostly deep blue; foliage evergreen; leaves pinnately nerved (except in no. 8).

Branchlets terete; leaves usually with conspicuous glandular teeth, commonly of unequal size but mostly small, often thickly set on the branchlets or even crowded; panicles small, often subglobose or short-oblong, frequently on long peduncles; low or prostrate shrubs.

Leaf-margin flat, glandular-toothed.

Leaves dull above.

Stems creeping; leaf-blades rounded, villous-pubescent; panicles few (3 to 8)-flowered........1. *C. diversifolius.*

Stems not creeping; low flat-topped shrub; leaf-blades elliptical to ovate, pale and pubescent beneath; panicles dense, many-flowered..2. *C. lemmonii.*

Leaves glossy or waxed above; low, densely branched.

Peduncles mostly 2 to 5 lines long; central California near coast..3. *C. foliosus.*

Peduncles 1¼ to 2 inches long; San Diego Co........4. *C. austromontanus.*

Leaf-margin revolute.

Upper surface papillate all over; panicles oblong........5. *C. papillosus.*

Upper surface papillate on margin; panicles subglobose........6. *C. dentatus.*

Branchlets angular; leaves greener above than below; tall shrubs or small trees.

Leaf-blades pinnately veined, with revolute edges........7. *C. parryi.*

Leaf-blades strongly 3-nerved, plane........8. *C. thyrsiflorus.*

Panicles large and commonly compound (except no. 12); leaves mostly 3-nerved.

Leaf-blades serrulate, ample, prominently 3-nerved; branchlets stout.

Foliage evergreen, firm and thick.

Flowers pale blue; leaves green but dull above, whitened beneath; small tree; Santa Barbara Islands........9. *C. arboreus.*

Flowers white; leaves deep green and shining or varnished above; mostly northern mountains........10. *C. velutinus.*

Foliage deciduous, thinner; flowers white; Siskiyou Co. and north........11. *C. sanguineus.*

Leaf-blades entire, mostly medium or small, distinctly or obscurely 3-nerved, rarely pinnately nerved; branchlets slender; foliage mostly deciduous.

Low shrub; panicles subsimple, the peduncles short; flowers blue; capsule nearly crestless; leaf-blades oblong, small........12. *C. parvifolius.*

Tall shrub; panicles compound; flowers commonly white, sometimes blue or pinkish; capsule commonly with glands.

Leaf-blades commonly ovate, 3-nerved from the base; peduncles mostly 3 to 5 inches long; capsule 2 to 2½ lines wide, commonly with oblong glands; middle altitudes in high ranges, widely distributed........13. *C. integerrimus.*

Leaf-blades oblong, pinnately veined; peduncles ½ to 1½ inches long; capsules 2½ to 4 lines wide, strongly glandular-crested; high mts. of San Diego Co.; Eldorado Co. foothills........14. *C. palmeri.*

2. Branchlets more or less rigid and divaricate, spinose or subspinose; bark mostly white or gray; panicles mostly short-peduncled.

Capsules mostly crestless; flowers white or blue.

Branchlets with greenish or brownish bark, often angled, flexible but often with slender spines; leaf-blades pinnately veined........15. *C. spinosus.*

Branchlets with whitish bark, terete, rigid; leaf-blades 3-nerved........16. *C. leucodermis.*

Capsules crested.

Panicles simple, commonly cylindric; branchlets mostly rigid or stubby, not spinose, with greenish or brownish bark; leaf-blades rather weakly 3-nerved, glandular-denticulate.

Flowers pale or whitish, sometimes deep blue.

Leaves white beneath with a dense close felt or tomentum......17. *C. tomentosus.*

Leaves mostly glabrous above, short-pubescent, pale or greenish beneath........18. *C. sorediatus.*

Flowers deep blue or purplish; leaves hirsute........19. *C. oliganthus.*

Panicles compound, not cylindric; branchlets rigid and spiny; leaf-blades strongly 3-nerved; flowers white.

Low flat-topped shrub; capsule ridge-crested; leaf-blades mostly 5 to 10 lines long; high montane........20. *C. cordulatus.*

Tall shrub; capsule conspicuously warty or wavy-ridged; leaf-blades mostly 1¼ to 2½ inches long; near coast........21. *C. incanus.*

B. LEAVES OPPOSITE (EXCEPT IN 2 SPECIES), MOSTLY THICK AND SMALL, ENTIRE OR WITH PUNGENT-TIPPED TEETH BUT NEVER GLANDULAR; STIPULE-BASES PERSISTENT, BECOMING WARTY AND CORK-LIKE; FLOWERS IN SESSILE UMBELS; CAPSULES COMMONLY WITH HORNS AS WELL AS CRESTS.—Subgenus CERASTES.

1. Leaves alternate or exceptionally opposite; flowers white; S. Cal.

Leaf-blades mostly obcordate; capsules hornless........22. *C. verrucosus.*

Leaf-blades elliptic-obovate, entire, mostly retuse or notched at apex; capsules with stout horns.... 23. *C. megacarpus.*

2. Leaves opposite; rigidly branched shrubs.

Desert ranges or mountain slopes or areas bordering the deserts.

Horns slender or small, usually spreading; leaves entire to dentate all around..24. *C. greggii.*

Horns stout, usually erect; leaves with 7 or 8 teeth on a side........25. *C. pinetorum.*

Cismontane.

Leaves not revolute.

Erect or spreading shrubs.

Flowers white; leaves commonly entire (rarely dentate at apex); common, widespread........26. *C. cuneatus.*

Flowers blue or purple (exceptionally white); central Coast Ranges.

Leaves pungently dentate on upper half; coastal........27. *C. rigidus.*

Leaves mostly with 4 or 5 teeth on a side; North Coast Ranges, mostly back of the coast........28. *C. jepsonii.*

Prostrate or semiprostrate shrubs.

Leaves coarsely few-toothed towards apex; flowers blue; northern Sierra Nevada and high North Coast Ranges........29. *C. prostratus.*

Leaves subentire; flowers white; southern Sierra Nevada........30. *C. fresnensis.*

Leaves more or less revolute, pungently dentate or entire, the lower surface densely white-tomentose; Southern California........31. *C. crassifolius.*

1. **C. diversifolius** Kell. PINE MAT. Stems prostrate, 2 to 4½ feet long, with short ascending or erect branchlets; young stems short-villous; leaf-blades thin, broadly elliptical, obtusish or sub-acute at apex, mucronulate-serrulate and sometimes undulate, ½ to ¾ (or 1¼) inches long, green and pubescent above, pale and hirsutely tomentose beneath, the veins sometimes prominent; petioles 1 to 3 (or 6) lines long; panicles simple, small and few (3 to 8)-flowered, 5 to 7 lines long, on much longer peduncles; flowers blue or almost white; capsules with apical wing-like ridges, 1½ to 2 lines in diameter.

Open pine woods on ridges and flats, 3000 to 6000 feet: Sierra Nevada from Kern Co. to Shasta Co.; inner North Coast Range from northern Lake Co. to Trinity Co. May-June.

Field note.—Ceanothus diversifolius is procumbent or prostrate in habit, forming low soft gray-green mats which are very leafy and make a remarkably close ground cover. The usually somewhat rounded leaves and the very small inflorescence characterize this species which, while frequent or even abundant in a locality, as on Panoche Peak, Mariposa Co., is nevertheless, relatively, something of a rarity in the forest as a whole.

Locs.—Sierra Nevada: Greenhorn Pass, *Purpus* 5704; South Fork Middle Tule River, *Jepson* 4871; Kaweah River, *Coville & Funston* 1376; Millwood, Fresno Co., *Jepson* 2782; Patterson Mt., Fresno Co., acc. *A. E. Wieslander;* Wawona, *Jepson* 5651; betw. Hazel Green and Big Mdws., Mariposa Co., *Jepson* 14,015; Crane Creek, Yosemite, *Jepson* 4648; Duffield Ranch, Confidence, Tuolumne Co., *Bigelow;* Calaveras Big Trees, *T. Brandegee* 45; Antelope, Amador Co., *Hansen* 1097; Dutch Flat, *T. Brandegee* 44; Mt. Shasta, *F. H. Williams.* North Coast Ranges: Elk Mt., n. Lake Co., *Tracy* 2348; Buckeye Mt., Trinity Co., *H. S. Yates* 549.

Refs.—CEANOTHUS DIVERSIFOLIUS Kell. Proc. Cal. Acad. 1:58 (1855), type loc. Placerville, *E. W. Garvett;* Jepson, Man. 617 (1925). *C. decumbens* Wats. Proc. Am. Acad. 10:335 (1875), the first specific locality stated being Mariposa Grove (*Bolander* 6331).

2. **C. lemmonii** Parry. PLUMAS BUSH. Low spreading shrub (1½ to 3½ feet high) with long rigid or at least firm branches and light gray bark; branchlets usually short, tomentose or pubescent; leaf-blades elliptical to broadly ovate, 3 to 12 lines long, microscopically serrulate, plane, nearly glabrous above, pale and pubescent beneath; petioles very short or almost none; panicles simple, oblong or globose, 5 to 12 lines long, the tomentose peduncles little or no longer; flowers blue; capsules 1¾ lines broad, rather strongly crested.

Hill slopes, 1800 to 3500 feet: Sierra Nevada foothills from Placer Co. to Shasta Co., thence west to Trinity Co. Apr.-May.

Locs.—Sierra Nevada: Colfax, *Sonne;* Grass Valley, *Bigelow;* Rose Sprs., Placer Co., *M. H. Gates;* Rough and Ready, Nevada Co., *Jepson* 14,034; American Valley, Plumas Co., *Lemmon;* Stirling, Butte Co., *Heller* 10,810; Forest Ranch, Butte Co., *Heller* 11,371; Morley sta., Oak Run, Shasta Co., *M. S. Baker* 383; Cedar Run, Shasta Co., *Baker & Nutting.* Trinity Co.: Hay Fork Mt., *Tracy* 6433; Weaverville (n. of), *H. S. Yates* 310.

Refs.—CEANOTHUS LEMMONII Parry, Proc. Davenp. Acad. 5:192 (1889), type loc. Johnson's ranch near Quincy, *Lemmon;* Jepson, Man. 617 (1925).

3. **C. foliosus** Parry. SCRUB CEANOTHUS. Depressed shrub (½ to 1 foot high), commonly dense at base, with horizontally spreading or diffuse branches 1½ to 3 feet long, or in chaparral often erect and 2 to 3 feet high or taller; branchlets often long, straight, shortly villous; leaves commonly with smaller ones fascicled in their axils, the blades broadly oblong, mostly obtusish, undulate or somewhat infolded longitudinally, quite glabrous or obscurely hairy on the veins beneath, 2 to 6 (or 10) lines long, upper surface dark green, lower lighter green or whitish or glaucous, the minute teeth of the margin tipped with glands; petiole distinct but very short; panicles simple, globose to oblong, ¼ to 1 inch long, the peduncles naked, 2 to 5 (or rarely 9) lines long; flowers blue; capsules 1½ lines broad, smooth, reddish, lobed, crested.

Exposed ridges and rocky slopes, 200 to 3500 feet: Coast Ranges from Mendocino Co. to the Santa Cruz Mts. Apr.-May.

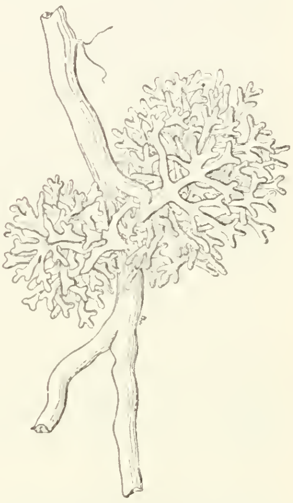

Fig. 227. CEANOTHUS FOLIOSUS Parry; root tubercles. × 1⅔.

Habit note.—Ceanothus foliosus is commonly disposed to be procumbent or semi-prostrate, or at most but 2 or 3 feet high, especially on rocky ridges. However, on the Mendocino coast near Kenny, where it forms pure colonies, it may become very slender and erect and up to 16 feet high. Nodules are well-developed on its root system and were first noted by us on Mt. Tamalpais in 1912 (cf. fig. 227).

Locs.—Jackson Valley, nw. Mendocino Co., *Jepson* 1864; Forty Dollar Mt., Miyakma Range, *Jepson* 9242; betw. Comptche and Low Gap, Mendocino Co., *Jepson* 2171; Mt. Hanna, Lake Co., *Jepson* 14,021; Mt. St. Helena, *Jepson;* Franz Valley grade near Calistoga, *Jepson* 14,019; Howell Mt., *Jepson* 5312; Mt. Tamalpais, *Jepson* 1192b; Greeninger Creek, w. of Gilroy, *Jepson* 9691.

Refs.—CEANOTHUS FOLIOSUS Parry, Proc. Davenp. Acad. 5:172 (1889), type loc. "upper Napa Valley" (that is, in the mountains near Calistoga), *Parry;* Jepson, Fl. W. Mid. Cal. 256 (1901), ed. 2, 254 (1911), Man. 617, fig. 617 (1925). *C. diversifolius* var. *foliosus* K. Bdg. Proc. Cal. Acad. ser. 2, 4:201 (1894).

CEANOTHUS LOBBIANUS Hook. Bot. Mag. t. 4811 (1854), type from Cal., *Lobb* (the large single leaf figured on the corner of the plate in the Botanical Magazine illustration belongs, as evidenced by the Kew Herbarium, to a sterile shoot gathered by Lobb). *C. dentatus* var. *lobbianus* Jepson, Man. 618 (1925). Bush; leaf-blades oblong, green above, olive-color beneath, glandular-serrulate, nearly glabrous, 7 to 14 lines long; peduncles 1½ to 2 lines long; panicles 1 to 2½ inches long; capsules 1¼ lines wide.—Santa Cruz Mts., *Jepson* 13,434; Empire grade, n. of Santa Cruz, *Clevenger.* Knowledge of this form is limited, but it is perhaps nearest C. foliosus.

4. **C. austromontanus** Abrams. SMALL-POD CEANOTHUS. Erect shrub 4 to 8 feet high, similar to C. foliosus; capsules shallowly lobed, commonly without conspicuous crests, 1½ lines wide.

Dry mountain slopes in coniferous woods, 3500 to 5000 feet: Cuyamaca Mts.

Refs.—CEANOTHUS AUSTROMONTANUS Abrams, Bull. N. Y. Bot. Gard. 6:412 (1910), type loc. betw. Julian and Cuyamaca, San Diego Co., *Abrams* 3966; Jepson, Man. 617 (1925).

5. **C. papillosus** T. & G. Bennie Bush. (Fig. 228.) Open irregularly spreading shrub, 4 to 6 feet high; foliage and inflorescence usually crowded on the branches; stems and peduncles hirsutulose; leaf-blades oblong to linear, or even narrowly linear by the strong revolution of the margin, ½ to 2¼ inches long, obtuse at base, rounded or truncate at summit, the upper surface deep green, minutely hirsutulose, usually corrugated or roughened and thickly sprinkled with glandular-papillate protuberances, the lower surface pale pubescent or more commonly densely whitish felt-like and often in addition hispidulose; panicles simple, cylindric or very short-cylindric, usually dense, ½ to 1¾ inches long, the peduncles naked, solitary or clustered, as long or often much longer; flowers blue; capsules distinctly 3-lobed with low narrow or lineate crests, 1½ lines broad.

Dry hill slopes, 25 to 3250 feet: near the coast from Santa Cruz Co. to Monterey Co.; Santa Ana Mts., Orange Co. May-June.

Locs.—Santa Cruz (n. of), *Jepson* 9776a; Monterey, *E. K. Abbott;* Cold Spr. near Posts, Monterey coast, *Jepson* 2600; Tassajara Hot Sprs., *Elmer* 3342; Arroyo Seco, Santa Lucia Mts., *E. K. Abbott* 3; Santa Lucia Peak, *Jepson* 4741; Holy Jim Cañon, Santa Ana Mts., *Peirson* 3492. Var. REGIUS Jepson, the leaves less papillose, is a form in southern San Mateo Co.

Refs.—CEANOTHUS PAPILLOSUS T. & G. Fl. N. Am. 1:268 (1838), type from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. 257 (1901), ed. 2, 254 (1911), Man. 617 (1925); Paxton's Fl. Gard. 1:74, fig. 50 (1851). *C. dentatus* var. *papillosus* K. Bdg. Proc. Cal. Acad. ser. 2, 4:203 (1894). Var. REGIUS Jepson, Man. 618 (1925), type loc. Kings Mt., San Mateo Co., *C. F. Baker* 804.

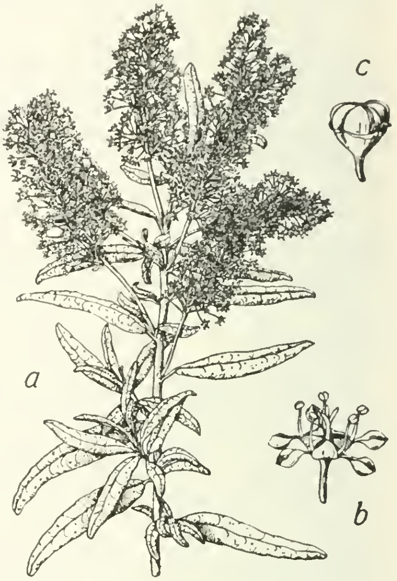

Fig. 228. CEANOTHUS PAPILLOSUS T. & G. *a*, flowering branch, × ½; *b*, fl., × 2½; *c*, capsule, × 2½.

6. **C. dentatus** T. & G. Sand Scrub. Low densely branched shrub 1 to 3 feet high; branchlets and peduncles tomentulose or pilose; leaf-blades obovate or elliptical, becoming strongly or irregularly revolute and therefore narrow or irregular in outline, usually truncate or retuse at apex, the infolding of the margin often such as to increase the prominence of the apical notch, pubescent on both surfaces and pale or whitened below, glandular-papillate on the (apparent) margin, 3 to 5 (or 12) lines long but of very unequal size; panicles simple, cylindric to globose, ½ to 1¼ inches long, on leafy peduncles nearly as long; flowers blue; capsules 2 lines broad, with prominent thin crests.

Sandy hills and mountain slopes, 20 to 2500 feet: along the coast from Monterey Co. to San Luis Obispo Co. Apr.-June.

Locs.—Pajaro Hills, *Chandler* 401; Monterey, *Jepson* 2994, 9768; San Simeon, *K. Brandegee.*

Var. **floribundus** Trel. Flowers in dense globose subsessile clusters which closely crowd the branches.—Monterey.

Var. **impressus** Trel. Prostrate; leaf-blades roundish, with deep straight furrows or impressions on the upper surface over the veins.—Along the northern Santa Barbara and southern San Luis Obispo coasts: Surf, *Elmer* 3870; Nipomo mesa, *McMinn* 4339.

Refs.—CEANOTHUS DENTATUS T. & G. Fl. 1:268 (1838), type from Cal., *Douglas;* Torr. Bot. Mex. Bound. 46, pl. 10 (1859); Jepson, Fl. W. Mid. Cal. 257 (1901), ed. 2, 254 (1911), Man. 618 (1925). Var. FLORIBUNDUS Trel.; Gray, Syn. Fl. 1^1:415 (1897); Jepson, Man. 618 (1925). *C. floribundus* Hook. Bot. Mag. t. 4806 (1854), collected in Cal. (*Wm. Lobb* 23), doubtless in the South Coast Ranges. Var. IMPRESSUS Trel.; Gray, Syn. Fl. 1^1:415 (1897); Jepson, Man. 618

(1925). *C. impressus* Trel. Proc. Cal. Acad. ser. 2, 1:112 (1888), type loc. Santa Barbara Co., *Sara A. Plummer.*

7. **C. parryi** Trel. LADY-BUSH. Shrub 4 to 6 (or 18) feet high; branchlets angular and, when young, tomentose, the 1-year-old ones reddish; leaf-blades pinnately veined, narrowly to broadly oblong, ¾ to 2½ inches long, dark green above, finely cobwebby-tomentose beneath, the margin denticulate but seemingly entire because soon revolute; petioles 2 lines long; panicles simple, oblong or distinctly broader below, 1 to 3 inches long, on sparsely leafy peduncles twice as long; bractlets white, hairy; flowers blue; capsules globose, smooth, 2 lines broad.

Wooded cañons and mountain slopes, 100 to 2500 feet: Napa and Sonoma Cos. to Humboldt Co. Apr.-June.

Field note.—Ceanothus parryi is closely related to C. thyrsiflorus. These species are in addition very similar in habit and appearance, but C. parryi has more open branching and the bractlets of its inflorescence are very white. C. thyrsiflorus is distinctively a Redwood associate, while C. parryi grows further inland; it is, for example, very common in the chaparral of western Lake Co. The two are sometimes associated as in Humboldt Co., but C. thyrsiflorus is vastly more abundant, especially in the Redwood belt, while here again C. parryi ranges further inland.

Locs.—Betw. Mt. George and Milliken Creek, Napa Range, *Jepson* 14,385; St. Helena (w. of), *Jepson;* Calistoga, *Jepson* 14,023; Mt. St. Helena, *Jepson* 10,372; Howard, Sonoma Co., *Rivers;* Green Valley, w. Sonoma Co., *M. S. Baker;* Scotts Valley, w. Lake Co., *Tracy* 1728; betw. Halfway House and Low Gap, Mendocino Co., *Jepson;* betw. Briceland and Garberville, *Jepson;* Mail Ridge, Humboldt Co., *Jepson* 16,388; Hubbard sta. near Camp Grant, *Jepson* 1906; Weott, Humboldt Co., *Jepson* 16,491; Kneeland Prairie, n. Humboldt Co., *Tracy* 5823.

Refs.—CEANOTHUS PARRYI Trel. Proc. Cal. Acad. ser. 2, 1:109 (1888), type cult. at Calistoga, *Parry;* Jepson, Fl. W. Mid. Cal. 256 (1901), ed. 2, 254 (1911), Man. 618 (1925). *C. integerrimus* var. *parryi* K. Bdg. Proc. Cal. Acad. ser. 2, 4:183 (1894).

8. **C. thyrsiflorus** Esch. BLUE BRUSH. Shrub 3 to 8 feet high, or becoming a small tree up to 18 or 25 feet high, rather straight-limbed, the branchlets strongly angled and mostly ascending; leaf-blades elliptical or oblong-ovate, green on both surfaces, glabrous and shining above, paler and usually scantily hairy along the veins beneath, strongly 3-nerved beneath, the margin mucronate-serrate or serrulate with somewhat impressed glandular teeth, ¾ to 2 inches long; panicles dense, ¾ to 3 inches long, on somewhat leafy peduncles 2 to 4 inches long; flowers blue, rarely varying to white; capsules globose, smooth, little lobed, 1½ to 2 lines broad, glandular and black when ripe.

Wooded cañon sides or hill slopes, 10 to 1500 feet: along the coast from Monterey Co. to Del Norte Co. North to Oregon. Mar.-June.

Geog. note.—Ceanothus thyrsiflorus reaches its greatest development in the westerly portions of the Redwood belt. On the Mendocino coast we have observed dense stands of slender poles of this species as much as 18 to 25 feet high. Broadly speaking this species does not occur in the dense parts of mature or virgin Redwood stands, but it is one of the first species to appear on logged areas and is usually one of the dominants in the logged creek basins. Its two most common associates are Vaccinium ovatum Pursh and Myrica californica Cham. The prevailing form has large leaves with 3 strong primary ribs. On the inner margins of its range or in arid habitats, the leaves are smaller and the lateral ribs less marked. It is a strictly coastal species, never known in the middle or inner Coast Ranges. It is the only Ceanothus species in the Redwood belt north of the lower main Eel River (J. P. Tracy). The two trees discovered at Placerville by F. B. Herbert can scarcely be indigenous.

The root-system of Blue Brush is shallow, so that this species is readily killed completely by chaparral fires. On account of this surface root-system tall poles in the Mendocino woods are easily overthrown and usually occur more or less leaning. It does not crown-sprout. We first observed mycorrhizal tubercles on the roots in 1912, and it is of some interest that large or old well-grown trees occupy pockets of rich soil in the hills. Individuals of considerable size have been measured as follows: Mt. Tamalpais, pipe-line trail, 16 feet high, trunk 26 inches circumference at two feet: Ferndale, on Wildcat grade, tree 18 feet high, 28 inches circumference at 20 inches; between Mendocino City and Gonsalves ranch, tree 20 feet high, 3 feet in circumference at 3 inches. The greatest development of the species in size appears to be in the pure colonies between Usal and Cottonaby Creek, Mendocino coast.

Locs.—Pacific Grove, *Jepson* 14,007; Monterey, *Jepson* 2994; Little Arthur Creek, w. of Gilroy, *Jepson* 9685; Soquel Creek, Santa Cruz Mts., *Jepson* 13,433; Boulder Creek, Santa Cruz

Mts., *Bergfried;* North Berkeley Hills, *Jepson* 9634; Mt. Tamalpais, *Jepson* 14,006; betw. Philo and Greenwood, Mendocino Co., *Jepson;* betw. Comptche and Low Gap, Mendocino Co., *Jepson* 2170; Ft. Bragg, *W. C. Mathews;* Weott, Humboldt Co., *Jepson* 16,492; Korbel, n. Humboldt Co., *Jepson* 1928; Big Lagoon, Humboldt coast, *Jepson* 9409; Crescent City, *Davy.*

Var. **griseus** Trel. Branchlets stout; leaf-blades roundish-ovate to elliptic, obtusish, silky beneath with dense short hairs, as much as 1¾ inches long, the margin revolute between the low teeth; panicles rather large (1¼ inches long) but dense and compact.—Mill Creek near Posts, Santa Lucia Mts., *Jepson* 2609; Monterey; Ft. Ross.

Var. **chandleri** Jepson. Branchlets slender; leaf-blades small (10 lines long or less), puberulent beneath; panicles subglobose, 7 to 8 lines long on peduncles 2 to 3¾ inches long; flowers pale blue.—Pajaro Hills, Monterey Co.

Refs.—CEANOTHUS THYRSIFLORUS Esch. Mem. Acad. Petersb. ser. 6, 10:285 (1826), type loc. California (probably San Francisco), *Eschscholtz;* Sargent, Silva 2:43, t. 64 (1891); Jepson, Fl. W. Mid. Cal. 256 (1901), ed. 2, 253 (1911), Man. 618, fig. 618 (1925). Var. GRISEUS Trel. in Gray, Syn. Fl. 1^1:415 (1897), type loc. Monterey; Jepson, Man. 619 (1925). Var. CHANDLERI Jepson, l.c., type loc. Pajaro Hills, n. Monterey Co., *Chandler* 402.

9. **C. arboreus** Greene. ISLAND CEANOTHUS. Shrub, or often a small tree, 12 to 20 feet high with distinct trunk and round but open crown; branches woolly-puberulent; leaf-blades broadly ovate to elliptic, obtuse or acutish, rounded to obscurely cordate at base, mucronate-serrulate, 1 to 3 inches long, above dark green and glabrescent, beneath 3-ribbed and whitened (or light slate-color) with a thin but close fine felt; panicles compound, 2 to 3⅓ inches long; flowers pale blue, fragrant; capsules large (4 lines broad), blackish when ripe and strongly ridge-crested on the back of the lobes and strongly wrinkled all over.

Dry hill slopes and cañons: Santa Barbara Islands (Santa Catalina, Santa Cruz and Santa Rosa islands). Feb.-Mar.

Ceanothus arboreus, an insular species, is remarkable for its ample foliage, usually much whitened beneath, and large leaf scars on old wood. It has long been cultivated and is a valued shrub in ornamental gardens. On Santa Cruz Island we have often measured trunks 4 to 6 inches in diameter.

Locs.—Santa Catalina Isl., *Gambel* (who first collected it), *Jepson* 3062; Pelican Bay, Santa Cruz Isl., *Jepson* 12,105; Freys Harbor, Santa Cruz Isl., *A. L. Grant* 1730; Santa Rosa Isl., *T. Brandegee.*

Refs.—CEANOTHUS ARBOREUS Greene, Bull. Cal. Acad. 2:144 (1886), type loc. Santa Cruz Isl., *Greene;* Jepson, Man. 619 (1925). *C. velutinus* var. *arboreus* Sarg. Gard. & For. 2:364 (1889), Silva 2:45, t. 65 (1891). *C. arboreus* var. *glabra* Jepson, l.c., type loc. Santa Rosa Isl., *T. Brandegee;* herbage glabrous or nearly so.

10. **C. velutinus** Dougl. TOBACCO BRUSH. Stems several or many from the base, commonly diffusely spreading and forming a low rounded shrub 2 to 5 feet high, rarely tree-like and up to 12 feet high; herbage with a strong cinnamon odor; leaf-blades round-ovate or elliptic, obtuse at apex, rounded or subcordate at base, glandular-serrulate, 1 to 3½ (mostly 1½ to 2½) inches long, dark green, glabrous and usually glandular-varnished above, often drying chocolate-brown, pale and with a very minute close pubescence beneath, the veins puberulent, strongly 3-nerved, the lateral nerves with marked marginal veins; panicles ¾ to 3¾, commonly 2 to 3 inches long; flowers white; capsules lobed at top, very sticky-glandular, 2 lines broad, crests small or almost none.

Dry mountain summits and slopes, 3500 to 8500 feet: Sierra Nevada from Tulare Co. to Modoc Co.; North Coast Ranges from Humboldt Co. to Siskiyou Co. North to Washington, east to Colorado and South Dakota. May-July.

Field note.—Ceanothus velutinus forms extensive brush fields on the mountain summits and plateaus in the northern Sierra Nevada from Sierra Co. to Shasta Co. and thence west to the Marble Mountain country in western Siskiyou Co. It is commonly the first species to take possession of cleanly logged or fire-burned areas and assists materially in giving something of the aspect of a desert to forest-denuded slopes of the Sierra Nevada. Likewise in the Siskiyou Mts. one may ride on the trails for miles through and often under a dense Ceanothus velutinus cover. In the northern regions, it is usually called Snow Brush. Along the Mendocino coast the var. laevigatus with its sticky upper leaf surface is known to the folk as "Greasewood".

Locs.—Sierra Nevada: Kern Cañon above Junction Camp, *Jepson* 1057; Mt. Dana, *Hillebrand;* Silver Mt., *J. Ball;* Angora Ridge, Eldorado Co., *Ottley* 858; Mt. Tallac, *Jepson;* Tahoe

City, *Jepson* 7737; Summit sta., Nevada Co., *Jepson* 14,013; Sierraville, *Jepson;* Martin Sprs., Eagle Lake, *Brown & Wieslander* 83; Manzanita Lake, Lassen Peak, *Jepson* 15,297; Eagle Peak, Warner Mts., *Jepson;* Goosenest Mt., e. Siskiyou Co., *Butler* 904. North Coast Ranges: Trinity Summit, *Jepson;* Salmon Summit, *Jepson;* Sisson, *Lorenzen;* Log Lake, Shackelford Creek, w. Siskiyou Co., *Butler* 412; Marble Mt., *Jepson.*

Var. **lorenzenii** Jepson. Leaf-blades smaller (1 to 1¼ inches long), thinner, less varnished above; panicles smaller.—Sierra Nevada: upper Kern River; Fallen Leaf, Eldorado Co., *Ottley* 921; Martin Sprs., Eagle Lake, *Brown & Wieslander;* Sisson, *Lorenzen.*

Var. **laevigatus** T. & G. Six to 18 feet high; leaf-veins beneath glabrous.—North Coast Ranges: Corte Madera, Marin Co., acc. *Mason;* Mt. Vision, Pt. Reyes peninsula, *Jepson;* Mt. St. Helena, *Jepson* 14,012; Sherwood Valley, Mendocino Co., *Jepson;* Noyo River, *Charlotte Hoak;* betw. Kenny and Usal, nw. Mendocino Co., *Jepson* 2152; Bear Buttes, Humboldt Co., *Harry A. Dutton;* Fruitland, Humboldt Co., *Jepson* 16,382; betw. Acorn and Green Pt. ranch, n. Humboldt Co., *Jepson* 1949; Gasquet, Del Norte Co., *M. S. Baker* 317.

Refs.—CEANOTHUS VELUTINUS Dougl.; Hook. Fl. Bor. Am. 1:125, t. 45 (1830), first collected by Douglas at the Kettle Falls of the Columbia and subalpine parts of the neighboring Rocky Mts.; Jepson, Fl. W. Mid. Cal. 255 (1901), ed. 2, 253 (1911), Man. 619 (1925). Var. LORENZENII Jepson, Man. 619 (1925), type loc. Junction Mdw., Kern Cañon, *Jepson* 5021. Var. LAEVIGATUS T. & G. Fl. 1:686 (1840); Jepson, ll.cc. *C. laevigatus* Hook. Fl. Bor. Am. 1:125 (1830), type loc. Nootka, Vancouver Isl., *Menzies.*

11. **C. sanguineus** Pursh. OREGON TEA-TREE. Tall shrub; branchlets reddish, flexible; leaf-blades broadly ovate, roundish or subcordate at base, 3-ribbed, nearly glabrous, serrate, thin, 1½ to 2½ inches long; panicles on old wood from lateral winter buds, compound, 2 to 4 inches long, commonly on short leafless peduncles; flowers white; capsules 1½ to 2 lines broad, crestless.

Wooded slopes, 3000 to 4000 feet: western Siskiyou Co. North to British Columbia and Idaho. May-June.

Locs.—Sisson, *Heller* 8051; Humbug Mt., *Butler* 1389; Moffitt Creek, *Duncan Dunning.* Oregon: Ashland Butte, *Jepson* 2563.

Refs.—CEANOTHUS SANGUINEUS Pursh, Fl. 167 (1814), type loc. Missouri River near the Rocky Mts., *Lewis,* but most likely Lolo Creek, Ida. (Contrib. U. S. Nat. Herb. 11:387); Jepson, Man. 619 (1925).

12. **C. parvifolius** Trel. CATTLE BUSH. Low flat-topped shrub with slender flexible branches, 2 to 4 feet high; herbage glabrous or nearly so; leaf-blades oblong, entire, obtusish, ½ to 1 inch long; panicles simple, cylindric, ½ to 1 (rarely 2) inches long, the peduncles rather shorter, sometimes longer; flowers deep or pale blue; capsules 2½ lines broad, nearly crestless.

Mountain flats or ridges, 4700 to 7000 feet: Sierra Nevada from Calaveras Co. to Tulare Co. June.

Locs.—Calaveras Big Trees, *Hooker & Gray;* Chinquapin, Wawona road, *Jepson* 8384; Grouse Creek, Yosemite, *Jepson* 4288; Wawona Pt., Mariposa Big Trees, *Jepson* 4288a, 5655; Arnold Mdw., Madera Co., *A. L. Grant* 1380; Kelty Mdw., Madera Co., *Kennedy;* Cascade, Fresno Co., *A. L. Grant* 1058; Deer Creek, McKinley Big Trees, acc. *Wieslander;* Marble Fork Kaweah River, *Jepson* 647; Kern Cañon, *Jepson;* South Fork Middle Tule River, *Jepson* 4878.

This species has been attributed to Lake Co., the inner North Coast Ranges and the Mt. Shasta region, but we have seen no specimens in validation. Such records in part, doubtless in all, rest on the small-leaved form of C. integerrimus which is characteristic of arid habitats and on the small-leaved form of its var. peduncularis.

Refs.—CEANOTHUS PARVIFOLIUS Trel. Proc. Cal. Acad. ser. 2, 1:110 (1888); Jepson, Man. 619, fig. 619 (1925). *C. integerrimus* var. ? *parvifolius* Wats. Proc. Am. Acad. 10:334 (1875), type loc. Yosemite region.

13. **C. integerrimus** H. & A. DEER BRUSH. (Fig. 229.) Widely branched shrub, 4 to 12 (or 16) feet high, often of greater breadth; bark yellowish-green; branches slender, often half drooping, ending in pliant green branchlets; leaf-blades ovate or oblong-ovate or rarely oblong, entire, ¾ to 2 (or 3½) inches long, 3-nerved from the base, glabrous or minutely pubescent, green above, lighter green below; panicles compound, thyrsoid or pyramidal, sometimes simple, 3 to 5 inches long, the leafy or nearly leafless peduncles as long or longer; flowers commonly white, sometimes pale blue, cream or pink; capsules globose, 2 to 2½ lines

broad, somewhat 3-lobed, with oblong glands on the back of each lobe near the middle.

Dry montane slopes: Sierra Nevada from Shasta and Modoc Cos. to Kern Co., 1000 to 7000 feet; higher Coast Ranges from Siskiyou Co. to San Luis Obispo Co., 1200 to 5000 feet; cismontane Southern California, 5000 to 7000 feet. North to Washington. June-Aug.

Geog. note.—The Deer Brush has its greatest development in the Sierra Nevada where it is one of the dominant shrubs in the lower portion of the Pinus ponderosa belt (Transition zone) throughout the range. A large spreading and somewhat loose shrub with ample thin leaves and large showy panicles of flowers, it is a distinctive feature of the forest understory, recurs in a similar zonal position in the higher Coast Ranges and in a somewhat modified form in the San Gabriel, San Bernardino and San Jacinto mountains of Southern California. The Sierra Nevada shrub is here taken as the biological type of the species. It bears a triple-nerved ovate or ovatish leaf which is rather large, that is 2 to 3½ inches long. Its midrib may and commonly does give off some fairly marked nerves at or above the middle, but they are weakly developed as compared with the basal laterals which do not run out to the margin and stop, but run high inside the margin. A vertical cross-section of the leaf is shown in fig. 230b which by its thinness and the nature of its cellular structure indicates the mesophytic habitat of the shrub.

Proceeding north through the Sierra Nevada and westerly around the head of the Sacramento Valley into fire-harried regions, we find that the foliage often becomes somewhat reduced, sometimes with many small oblong leaves on the smaller branchlets. On the arid chaparral ridges of the Coast Ranges from Lake Co. to the Santa Lucia Mts., ridges which have been fire-devastated for many centuries, a semi-xerophytic Deer Brush is common. It is often small-leaved, sometimes with extremely reduced leaves (¼ to ¾ inch long and 1 to 3 lines wide) as on Mt. Hanna in Lake Co. (*Jepson* 13,985), on Mt. Konocti (*Jepson* 14,073), and on Loma Prieta in the Santa Cruz Mts. These small leaves, associated with fire-scarred habitats, are frequently or even prevailingly oblong. The vertical cross-section of the leaf reflects the sub-xerophytic habitat (fig. 230c). The oblong ones are usually obscurely pinnate-veined. That is to say the adverse factors of the terrain have brought about a reduction in leaf size and have inhibited triple-nerve development. But although oblong leaves are so common, yet the individuals always bear a few conspicuously ovate triple-nerved leaves or even a preponderance of them. Thus we seem to have a sufficiently complete

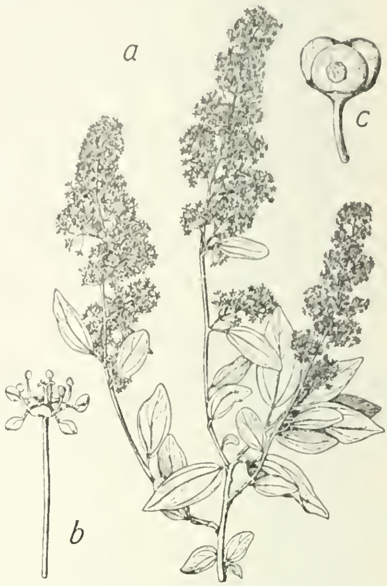

Fig. 229. Ceanothus integerrimus H. & A. *a*, flowering branch, × ⅓; *b*, fl., × 3; *c*, capsule, × 2.

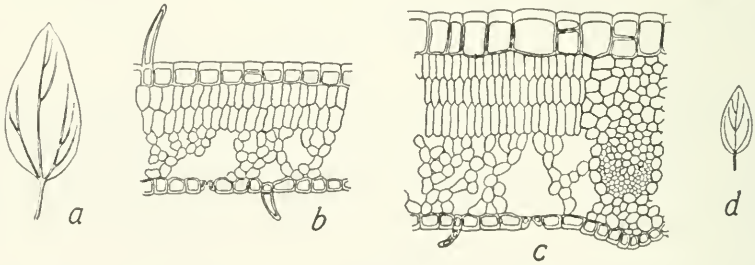

Fig. 230. Ceanothus integerrimus H. & A. *a*, mesophytic type of leaf, the prevailing form in the Sierra Nevada (Colony Mill, Tulare Co., *Jepson* 644), × ½; *b*, cross sect. of portion of leaf *a*, × 120; *c*, cross sect. of portion of leaf *d*, × 120; *d*, xerophytic type of leaf (Mt. Hanna, Lake Co., *Jepson*), × ½.

intergradation series to the shrubs representative of the formal type of Ceanothus integerrimus which inhabit the Santa Cruz Mountains about Mount Ben Lomond.

The original specimens of Ceanothus integerrimus were collected by David Douglas in California in 1831 and are preserved at the Royal Botanic Gardens at Kew, England (Herb. Hook.). They are in character so unlike the prevailing shrubs of the Sierra Nevada as to suggest at once that the name of Ceanothus californicus given the Sierra Nevada shrubs by Kellogg must be taken up as representing a species distinct from the shrubs described as Ceanothus integerrimus. The first to insist with much cogency on this view was E. L. Greene (Lflts. 1:65). We ourselves studied the type specimens of Ceanothus integerrimus H. & A. at Kew in 1905 and again in 1926 and 1930. There are two sheets, quite alike: one in the Herbarium Hookerianum and another in the Herbarium Benthamianum. The pinnate-veined character of the leaves, their thinness and oblong outline are remarkable features. In a few of the larger leaves the basal pair of nerves is, sometimes, rather strong, which would account, in our opinion, for the otherwise anomalous phrase, "foliis 3-costatis", of the original diagnosis. The prevailing type of leaf in all material is, however, that described above, markedly oblong in some degree, pinnately veined and thin.

In May, 1888, C. C. Parry collected specimens near Ben Lomond in the Santa Cruz Mts. which match in a truly remarkable manner the type specimens of Douglas at Kew. We know that Douglas was at Santa Cruz during his stay in California. Since this particular form has not been collected elsewhere, it seems probable that Ben Lomond may be the original locality for the Douglas specimens. Discovery of the Ben Lomond locality was made a little prior to Parry by C. L. Anderson; and there have been subsequent collections. All this material is almost singularly uniform and is remarkable for the oblong or oblong-elliptic leaves which are 5 to 13 lines long, rounded at both ends, quite thin, and as if glabrous or only minutely puberulent. As of greatest significance, the leaves are delicately pinnate-veined. The capsules, 2 lines wide, are crestless or perhaps sometimes weakly glandular-crested. Cf. fig. 231.

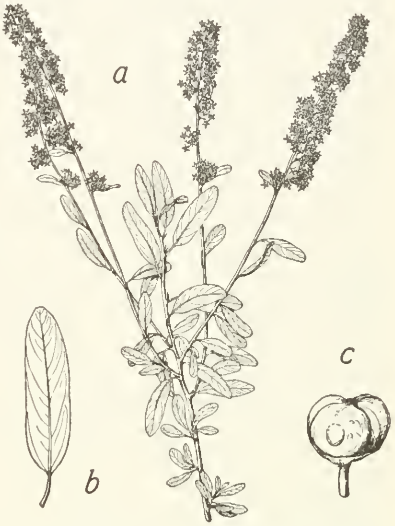

Fig. 231. CEANOTHUS INTEGERRIMUS H. & A. Drawing of a specimen from Ben Lomond, Santa Cruz Mountains, *C. C. Parry*, May, 1888, which compares exactly with the Douglas type in the herbarium of the Royal Botanic Gardens at Kew, England. *a*, flowering branch, × ¼; *b*, leaf, × ⅔; *c*, capsule, × 3.

Assuming C. L. Anderson to be the original discoverer, Parry named the Ben Lomond shrub Ceanothus andersonii, although he had first distributed specimens of it under the name Ceanothus palmeri Trel., a shrub of the mountains of San Diego Co. The leaves of Ceanothus palmeri in shape resemble closely those of the Ben Lomond shrub and are pinnately veined. They are, however, slightly thicker, a difference evidently to be correlated with the greater aridity of the Cuyamaca Mts. as compared with the Santa Cruz Mts. Ceanothus palmeri and Ceanothus integerrimus of Ben Lomond have a certain similitude, but are here regarded as definitely different units.

On the other hand the problem as between typical Ceanothus integerrimus and the Sierra Nevada shrubs is not simple. If the dominant form of the Sierra Nevada may under a change of conditions develop small thick oblong leaves obscurely pinnately veined as in the inner Coast Ranges, may it not develop thin pinnately veined oblong leaves as an adaptation in the Santa Cruz coastal forests? It is a question to be resolved by further field studies, or better by garden cultures. As it is, we leave, for the present, the Sierra Nevada shrubs in possession of the name Ceanothus integerrimus which they have borne so long. The problem is, however, an interesting one—the most interesting in Ceanothus which is at once historical and ecological. It should be added that in Gray's Synoptical Flora (1^1:411) the original Ceanothus integerrimus is described under the name Ceanothus andersonii Parry and is held as distinct from the Sierra Nevada shrubs. Three stations near Ben Lomond village were found by J. T. Allen in 1935. One of these represents the original thin-leaved pinnate-veined type; another exhibits thicker leaves, pinnately veined on the branchlets, strongly 3-nerved on the main branches.

Deer Brush is usually semi-deciduous, but some leaves persist all winter. It may, in favorable habitats, as on north slopes, form a nurse cover for coniferous seedlings. In such cases it is eventually shade-killed as the new forest establishes a more complete crown canopy.

Locs.—Sierra Nevada: Bowens Sprs., Modoc Co., *M. S. Baker* 516; Upper Fall River Valley, ne. Shasta Co., *Jepson;* Cow Creek Mts., Shasta Co., *M. S. Baker;* Stirling, Butte Co., *Jepson;*

Belden, Plumas Co., *Jepson;* Bear Valley, Nevada Co., *Jepson* 13,984; Pine Grove, Amador Co., *Hansen* 54; Calaveras Big Trees, *A. L. Grant;* Five Mile Creek, South Fork Stanislaus, *A. L. Grant* 740; Lake Eleanor, *A. L. Grant* 4690; Hetch-Hetchy *Jepson;* Yosemite, *Jepson* 10,453; Peregoy Mdw., Mariposa Co., *A. L. Grant* 1298; Merced Cañon above El Portal, *Jepson* 8353; Cedar Creek, North Fork Kaweah River, *Jepson* 604; Clough Cave, South Fork Kaweah River, *Jepson* 4654; Cold Spr., North Fork Tule River, *Jepson.* Coast Ranges: Siskiyou Mts., near Preston Peak, *Jepson;* Yreka, *Butler* 411; Shackelford Creek, w. Siskiyou Co., *Jepson;* Shasta Sprs., Siskiyou Co., *Jepson* 13,986; Devils Backbone, w. Siskiyou Co., *Jepson* 2063 (blue fls.), 2063a (white fls.); Campbell Creek, Hupa, *Chandler* 1338; Weaverville, Trinity Co., *H. S. Yates* 282; Brannan Mt., n. Humboldt Co., *Tracy* 3427; Kneeland Prairie, *Chesnut & Drew;* ridge betw. Van Duzen and Mad rivers, *Tracy* 2793; Mail Ridge, Humboldt Co., *Jepson* 16,384; Bell Sprs., n. Mendocino Co., *Jepson* 1879; South Yollo Bolly, *Jepson;* Mt. Sanhedrin, *Heller* 5881; Walker Valley, Mendocino Co., *Jepson* 1824; Willits, *Jepson* 2493; head South Mill Creek, Ukiah, *Jepson* 9247 (fls. white), 9236 (fls. blue); Red Mt., Miyakma Range, *Jepson* 3034; Mt. St. Helena, *K. Brandegee;* Little Sulphur Creek, Sonoma Co., *M. S. Baker* 653; Santa Lucia Peak, *Jepson* 4742; Lorenzo Creek, s. San Benito Co., *Jepson* 12,217; Waltham Creek, w. Fresno Co., *Jepson.* S. Cal.: Tujunga Cañon, San Gabriel Mts., *Peirson* 2138; Waterman Cañon, San Bernardino Mts., *Jepson* 5550; Cuyamaca Mts., *T. Brandegee.*

In the San Gabriel, San Bernardino and San Jacinto mountains the leaves are sometimes puberulent in varying degree (var. puberulus Abrams). This slightly pubescent state also occurs at various stations in the Sierra Nevada. A form with long and narrow panicles on long (3 to 4 inches) peduncles occurs in Shasta and Trinity Cos. (var. peduncularis Jepson).

Refs.—CEANOTHUS INTEGERRIMUS H. & A. Bot. Beech. 329 (1840), type from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. 256 (1901), ed. 2, 253 (1911), Man. 620, fig. 620 (1925). *C. andersonii* Parry, Proc. Davenp. Acad. 5:172 (1889), type loc. near Ben Lomond, Santa Cruz Mts., *Anderson.* *C. californicus* Kell. Proc. Cal. Acad. 1:55 (1855), type loc. Placerville, *E. W. Garvitt.* *C. integerrimus* var. *californicus* Benson, Contrib. Dudley Herb. 2:120 (1930). *C. nevadensis* Kell. Proc. Cal. Acad. 2:152, fig. 45 (1862), type loc. Yosemite Valley, *Werthermann.* *C. thyrsiflorus* var. *macrothyrsus* Torr. Bot. Wilkes Exped. 263 (1874), type loc. Umpqua River, Ore. *C. macrothyrsus* Greene, Lflts. 1:68 (1904). Var. PUBERULUS Abrams, Bull. N. Y. Bot. Gard. 6:409 (1910). *C. puberulus* Greene, Lflts. 1:66 (1904), type loc. San Bernardino Mts. Var. PEDUNCULARIS Jepson, Man. 620 (1925). Perhaps *C. peduncularis* Greene, Lflts. 1:67 (1904), type loc. Mt. Hood, Ore., *H. D. Langille.*

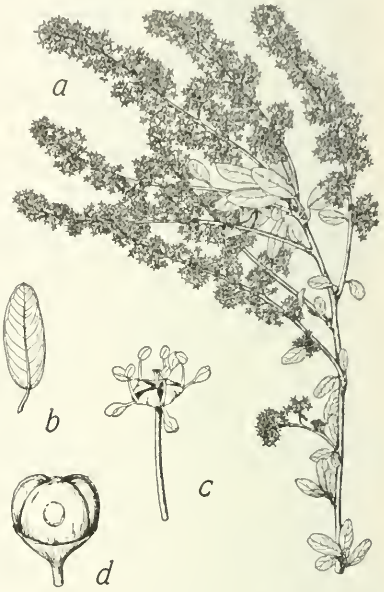

Fig. 232. CEANOTHUS PALMERI Trel. *a*, flowering branchlet, × 1/3; *b*, leaf, × 2/3; *c*, fl., × 3; *d*, capsule, × 2.

14. **C. palmeri** Trel. CUYAMACA BUSH. (Fig. 232.) Shrub 4 to 7 (or 15) feet high; bark grayish-green; leaf-blades oblong, obtuse at apex, light green above, pale beneath, delicately but distinctly pinnate-veined, 2 to 12 (or 16) lines long; panicles dense, 2 to 4½ inches long, on short (½ to 1½ inches) leafy peduncles; flowers white; capsules globose, 3-lobed, 2½ to 4 lines wide, the glandular crests large.

Montane ridges and slopes, 1400 to 6000 feet: Eldorado Co. foothills; San Jacinto Mts. to the Cuyamaca Mts. South into Lower California. May-June.

Geog. note.—In 1907, K. Brandegee collected on Sweetwater Creek in Eldorado County a shrub with oblong leaves, which are obtuse at base and apex and pinnately veined. A. E. Wieslander found the same thing in 1927 on Flagstaff Hill between the North and South Forks of the American River. These shrubs of Eldorado County are quite like the San Diego County shrubs, whence came the original Ceanothus palmeri. It is not, however, unusual for a species of San Diego County to reappear in the central Sierra Nevada foothills. For example, Ceanothus tomentosus in somewhat altered form occurs in both coastal Southern California and in the central Sierra Nevada foothills; so do Jepsonia parryi and other herbs. It is worth noting that

Ceanothus palmeri in Eldorado County occupies a zonal position (Upper Sonoran) below that of Ceanothus integerrimus (Lower Transition). Southern California localities are here cited as follows: Palomar Mt., *Jepson* 1502; Mesa Grande, San Diego Co., *E. Ferguson* 66; Logan Creek, Cuyamaca Mts., *C. V. Meyer* 178; Laguna Lakes, Laguna Mts., *Peirson* 5931; Descanso, *T. Brandegee.*

Refs.—CEANOTHUS PALMERI Trel. Proc. Cal. Acad. ser. 2, 1:109 (1888), type loc. "mountains of Southern California" (more specifically San Diego Co.), *Palmer* 42. *C. spinosus* var. *palmeri* Jepson, Man. 620 (1925); not *C. spinosus* var. *palmeri* K. Bdg. Proc. Cal. Acad. ser. 2, 4:185 (1894).

15. **C. spinosus** Nutt. RED-HEART. Straggling shrub 5 to 10 feet high, or forming a small tree up to 24 feet; branchlets flexible, often ridged, glabrous or nearly; bark of the branchlets greenish-yellow, spines (not always present) slender, rigid, leafy below the middle; leaf-blades oblong to elliptic, obtuse or emarginate, entire or serrulate, nearly or quite glabrous, ½ to 1 or 1½ inches long, drying reddish-brown above, greenish below, obscurely pinnate-veined; panicles simple or compound, long and narrow, sometimes pyramidal or loose, usually interrupted and leafy below, 1¼ to 4½ inches long; flowers pale blue or white; capsules scarcely lobed, resinous, not crested, 2 to 2½ lines broad.

Hill slopes and cañons, 500 to 3000 feet: near the coast from San Luis Obispo Co. to the Santa Ana Mts. Feb.-Apr.

Field note.—The spines are mostly on older wood, and not on wood of the season. They result, doubtless, from the hardening and defoliation of short leafy branchlets of the season. The wood of the root-crown dyes a deep red under mutilation by the axe, whence the folk name, Red-heart.

Locs.—San Luis Obispo, *J. E. Roadhouse;* Mission Cañon, Santa Barbara, *J. R. Hall;* Sycamore Cañon, Santa Inez Mts., *Jepson* 9154; Ojai Valley, *F. W. Hubby* 29; Topango Cañon, *Peirson* 733; Santa Monica, *Barber;* Trabuco Cañon, Orange Co. (Bull. N. Y. Bot. Gard. 6:410).

Refs.—CEANOTHUS SPINOSUS Nutt.; T. & G. Fl. 1:267 (1838), type loc. mts. near Santa Barbara, *Nuttall;* Jepson, Man. 620 (1925).

16. **C. leucodermis** Greene. JACK-BRUSH. Shrub 5 to 16 feet high, with white bark; branchlets rigid, divaricate, subspinose or spinose, whitish or glaucous; leaf-blades thickish, ovate, rounded at base, subacute at apex, entire or glandular-serrulate, ¼ to 1¼ inches long, short-petioled, glabrous or almost so above and commonly drying brownish, paler beneath and puberulent, especially along the veins, and often drying dull reddish; panicles simple, often long and narrow, often interrupted below, 1 to 2 inches long, on much shorter naked or scarcely leafy peduncles, or at times almost sessile; flowers white or blue; capsules little lobed, not crested or scarcely, but very glandular, 2 to 2½ lines broad.

Dry slopes and ridges, 900 to 6000 feet: Sierra Nevada foothills, rare from Shasta Co. to Tuolumne Co., common from Mariposa Co. to Kern Co.; inner Coast Ranges from the Mt. Hamilton Range to San Luis Obispo Co.; coastal mountains of Southern California. South to Lower California. Apr.-May.

Geog. note.—The shrub Ceanothus leucodermis has hitherto been described in nearly all texts under the name C. divaricatus Nutt. It is a misapplication of the name. Ceanothus divaricatus was originally collected at Santa Barbara by Nuttall and is a form of C. oliganthus as has in effect been indicated by K. Brandegee (Proc. Cal. Acad. ser. 2, 4:197). That Ceanothus divaricatus Nutt. is not the C. divaricatus of the Botany of California and other works has been shown by Greene (Kew Bull. 1895:15). The Nuttall specimen in the Gray Herbarium may be regarded as the type or its full equivalent, since the label is in the hand of Nuttall. It is brown-barked, not white-barked as in C. leucodermis; its panicle, loose and broad, is long-peduncled, not short-peduncled as usually in C. leucodermis. The type locality, Santa Barbara, is the classical locality for C. oliganthus, whereas C. leucodermis is a shrub of the inner ranges and has never, to our knowledge, been found on the coast line. It is, indeed, a well developed member of the hard chaparral of the inner ranges and is adapted not merely to xerophytic but to long-continued fire conditions. Its seed with a characteristically protected coat (see fig. 233) lies in the loose gravelly soil for years until an intensive change in conditions brought about by fire breaks the hibernation period.

Locs.—Sierra Nevada: Anderson, Shasta Co., *Alice King;* Bakers Ford, Middle Fork Cosumnes River, *Wieslander;* Yosemite Valley, *Jepson* 13,997; Mariposa, *Congdon;* Usona, Mariposa Co., *Jepson;* Kelty, Madera Co., *Kennedy;* Fresno Flats, *Jepson* 12,836; betw. Dunlap and Millwood, *Jepson* 2770; Whipstock Flat, Tulare Co., *Jepson;* Cedar Creek, North Fork Kaweah River, *Jepson* 603; Clough Cave, South Fork Kaweah River, *W. Fry* 393; Middle Tule River, *Jepson* 4860. Tehachapi Mts.: Bear Mt., *Jepson* 7167. South Coast Ranges: Cedar Mt., Alameda Co., *Jepson* 7443; Old Tully School, Bitterwater Valley, San Benito Co., *Jepson* 16,143; Stone Cañon, e. Monterey Co., *Jepson* 12,035; upper San Benito River, s. of Hernandez Valley, *Jepson* 15,428; Priest Valley, *Jepson* 2673. S. Cal.: San Gabriel Peak, *Peirson* 112; Coldwater Cañon, San Antonio Mts., *Peirson* 2281; Cajon Pass, *Jepson;* San Bernardino Mts., *Jepson* 5568 (Mill Creek Cañon), 5600 (Waterman Cañon); Strawberry Valley, Mt. San Jacinto, *Jepson* 2291, 2263; Saunders Mdw., San Jacinto Mts., *C. V. Meyer* 136; San Jacinto Cañon, *Jepson* 1290; Pala Mission, *Jepson* 8494; Palomar Mt., *Jepson* 1529; Warner Pass, e. San Diego Co., *Jepson* 8531; Banner grade, Cuyamaca Mts., *C. V. Meyer* 76; Witch Creek, San Diego Co., *Alderson* 1561; Live Oak Sprs., e. San Diego Co., *Jepson* 11,834.

Refs.—CEANOTHUS LEUCODERMIS Greene, Kew Bull. 15 (1895), type from Cal., *Lobb* 26. *C. divaricatus* B. & W. Bot. Cal. 1:103 (1876); Jepson, Man. 620, fig. 621 (1925); not Nutt. (1838). *C. divaricatus* var. *grosse-serratus* Torr. Pac. R. Rep. 4^5:75 (1857), *Bigelow*, type loc. not given (leaves large, strongly serrate, acute.—San Gabriel Mts.); Jepson, Man. 621 (1925). *C. divaricatus* var. *eglandulosus* Gray; Torr. l.c., type loc. mts. near San Gabriel, *Bigelow* (leaves small, entire, glabrous or nearly, glaucous, flowers white, sometimes blue.—San Gabriel Mts.); Jepson, Man. 621 (1925). *C. divaricatus* var. *laetiflorus* Jepson, Man. 620 (1925), type loc. Pala Mission, *Jepson* 8494. *C. spinosus* var. *palmeri* K. Bdg., Proc. Cal. Acad. ser. 2, 4:185 (1894); not C. palmeri Trel.

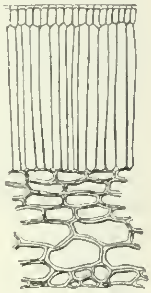

Fig. 233. CEANOTHUS LEUCODERMIS Greene; cross section of seed coat, × 185.

17. **C. tomentosus** Parry. IONE BUSH. Shrub 3 to 8 feet high; branchlets long and very slender, with gray or reddish bark, the young shoots rusty-tomentose; leaf-blades ovate to oblong-elliptic, obtuse, thickish but brittle, mostly 6 to 10 lines long (varying from 3 to 14 lines), obtuse, glandular-serrate, above dark green and minutely pubescent, beneath bright white with a close tomentose covering, or velvety, or sometimes rusty, sometimes merely pubescent; petioles 1 to 2 lines long; panicles lateral or terminal, mostly cylindric, ½ to 1½ (or 2) inches long, often interrupted below, borne on peduncles 5 to 10 lines long which often bear 1 or 2 small leaves at base; flowers azure-blue (sometimes nearly white); capsules 3-lobed, commonly brownish, 2 lines broad; crests thin or sometimes thickish.

Hill slopes, 300 to 4500 feet: Sierra Nevada foothills from Placer Co. to Mariposa Co. May.

Locs.—Forest Hill, Placer Co., *Bolander* 4558; betw. Magra and Cape Horn, *K. Brandegee;* Placerville, *F. B. Herbert;* Rock Creek, Eldorado Co., *O. M. Evans;* Ione, *Hansen* 804 (fls. blue), 805 (fls. white); Clinton Peak, Amador Co., *Hansen* 193; Kinsley, Mariposa Co., *Charlotte Hoak;* Sherlocks, Mariposa Co., *Congdon;* Snyder Mt. Mariposa Co., *Congdon.*

Var. **olivaceus** Jepson. RAMONA BUSH. Shrub 4 to 7 feet high; leaves olive-green beneath with a very fine and dense whitish felt-like covering or sometimes greenish and sparingly pubescent, the blades 3-nerved beneath (the main nerves with many lateral nerves), the margin glandular-denticulate, rarely serrate; peduncles ¾ to 2½ inches long; capsules commonly blackish.—Cañons and mesas, 200 to 2300 feet: San Bernardino Valley to San Diego Co. Lower California.

The plants here listed as var. olivaceus from coastal Southern California have passed for long with botanical writers and collectors as Ceanothus tomentosus. The pubescence on the leaves in the true C. tomentosus Parry from the northern Sierra Nevada foothills, a very different region geographically, is obviously and somewhat loosely woolly; it is a little rusty when young; and in character distinct from that of the form here called var. olivaceus. This form of Southern California may be even less related to the genuine C. tomentosus than is here indicated.

Locs.—Edgar Cañon, *Parish* 4103; Redlands, *Parish* 6817; Claymine Cañon, Santa Ana Mts., *J. T. Howell* 2608; Clevinger Cañon, Ramona, *Jepson* 8509; Escondido, *C. V. Meyer* 25a (glabrate form); Poway grade, *Parish* 10,755; Dehesa, *T. Brandegee;* Dulzura, *Wiggins* 1790; San Diego, *T. Brandegee* 823.

Refs.—CEANOTHUS TOMENTOSUS Parry, Proc. Davenp. Acad. 5:190 (1889), type loc. Ione, *Parry;* Jepson, Man. 621 (1925). *C. azureus* Kell. Proc. Cal. Acad. 1:55 (1855), type loc. Placerville, *E. W. Garvitt;* not C. azureus Desf. (1815). *C. oliganthus* var. *tomentosus* K. Bdg. Proc. Cal. Acad. ser. 2, 4:198 (1894). Var. OLIVACEUS Jepson, Man. 621 (1925), type loc. Clevinger Cañon, Ramona, *Jepson* 8509. *C. cyaneus* Eastw. Proc. Cal. Acad. ser. 4, 16:361 (1927), type loc. Lakeside, San Diego Co., *M. Phillbrook.*

18. **C. sorediatus** H. & A. Jim Brush. Erect shrub 4 to 7 (or 14) feet high with rigid divaricate branchlets; branchlets sparingly villous, at length olive-color or purplish; leaf-blades ovate or elliptic-ovate, green above, paler or whitish and slightly pubescent beneath, glandular-denticulate, 3-nerved, 5 to 10 lines (or to 1½ inches) long, on petioles a line or two long; panicles simple, terminal or sub-terminal, 1 or 2 (to 6) on each branchlet, ovate or broadly oblong, ½ to 1¼ inches long; flowers blue or almost white; capsules lobed, crested, 2 to 2½ lines broad.

Cañon sides, 300 to 2500 feet: Coast Ranges from Humboldt and Solano Cos. to Monterey Co.; Santa Inez Mts. to the Santa Ana Mts. Apr.-May.

Geog. note.—In chaparral of the hill country Ceanothus sorediatus often forms marked colonies on north slopes. If the fire interval is sufficiently long, tall individuals may develop. In Claremont Cañon, Berkeley Hills, a slender tree 16 feet high was measured in 1917; its trunk (5½ feet high to the forks) was 1½ feet in circumference at 1½ feet. On the other hand, in openly wooded gentle hill country, as in the Santa Margarita Hills, the individuals, spaced like Blue Oaks, may develop rounded crowns which in April are great balls of flowers resting on the ground. Ceanothus sorediatus does not, as a rule, crown-sprout, so that in consequence chaparral fires are extremely destructive to stands of this species. It is most abundant in the inner Coast Ranges from Solano Co. to San Luis Obispo Co. and is often the only species of the Euceanothi where it occurs. South of San Luis Obispo Co. it overlaps Ceanothus oliganthus, but it occurs only at scattered stations near the coast. Ceanothus oliganthus, in its entirety, is distinguishable from C. sorediatus only by pubescence. C. sorediatus simulates C. tomentosus var. olivaceus very closely in aspect and in shape of the leaf and hue of the under surface, but the former has larger flowers, its racemes are generally more compact and almost always borne on short peduncles or borne subsessile.

Locs.—Coast Ranges: Kneeland Prairie, Humboldt Co., *Tracy* 4902; Bull Creek, Humboldt Co., *Tracy* 6676; Wilder Range, s. Humboldt Co., *Tracy* 4986; Weldon Cañon, Vaca Mts., *Jepson* 2453; Tranchos Creek, Napa Range, *Jepson* 14,002; Caux's Knob, w. of St. Helena, *Jepson* 14,005; Mt. Tamalpais, *Jepson* 13,998; Oakland Hills, *Jepson* 6814; Las Trampas Ridge, *Jepson;* Donner Cañon, Mt. Diablo, *Jepson* 7586; Mt. Hamilton, *Jepson* 4200; Palo Alto, *C. F. Baker* 516; Guadalupe Mine, Santa Clara Co., *Jepson* 9095; Santa Lucia Creek, Santa Lucia Mts., *Jepson;* Santa Margarita, *Jepson* 11,965a; Arroyo Grande, *Summers* 138. S. Cal.: Santa Inez Mts., *Hall* 7849; Seminole Hot Sprs., Santa Monica Mts., *Peirson* 7116; Silverado Cañon, Santa Ana Mts., *Peirson.*

Refs.—CEANOTHUS SOREDIATUS H. & A. Bot. Beech. 328 (1840), type from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. 257 (1901), ed. 2, 254 (1911), Man. 621 (1925). *C. intricatus* Parry, Proc. Davenp. Acad. 5:169 (1889), type loc. Mt. Tamalpais summit, *Curran.*

19. **C. oliganthus** Nutt. Explorers Bush. Shrub, often with tree-like trunk, 4 to 9 feet high; branchlets densely short-hispid or villous, sometimes glabrescent, sub-flexible; leaf-blades ovate, obtuse or sub-acute, rounded at base or subcordate, denticulate, the teeth mostly glandular, ½ to 1½ inches long, thinly or scantily pubescent above, drying brown or blackish, beneath pale green or chestnut brown and pubescent or hirsute, especially along the veins; panicles mostly simple, broad, more or less open, ¾ to 1½ inches long; flowers deep blue or purplish; capsules roughly resinous, rather strongly crested, slightly depressed, 2 to 2½ lines broad.

Dry hills, 500 to 4500 feet: near the coast from San Luis Obispo Co. to the San Gabriel Mts. May-June.

Locs.—Santa Margarita Hills, *Summers;* Santa Barbara, *Brewer* 298; Ojai Valley, *Hubby;* Santa Susanna Mts., *Brewer* 214; Mt. Wilson, *Peirson* 113. The following variety is of doubtful importance.

Var. **orcuttii** Jepson. Flowers paler blue; capsules strongly rugose and loosely villous.—Mountains of San Diego Co., 1500 to 5000 feet: Palomar Mt., *Peirson* 6711; Julian, *Purpus.*

Refs.—CEANOTHUS OLIGANTHUS Nutt.; T. & G. Fl. 1:266 (1838), type loc. Santa Barbara, *Nuttall;* Jepson, Man. 621 (1925). *C. hirsutus* Nutt. l.c., type loc. Santa Barbara, *Nuttall. C. divaricatus* Nutt. l.c., type loc. Santa Barbara, *Nuttall.* Var. ORCUTTII Jepson (by error "Trel."), Man. 621 (1925). *C. orcuttii* Parry, Proc. Davenp. Acad. 5:194 (1889), type loc. "high mts. east of San Diego", *Orcutt. C. hirsutus* var. *orcuttii* Trel.; Gray, Syn. Fl. 1^1:414 (1897).

20. **C. cordulatus** Kell. Snow-brush. (Fig. 234.) Low widely-spreading thorny shrub (1 to 4 feet high and 3 to 9 feet across), rigidly and intricately

branched, its whitish somewhat crooked branches spreading horizontally or eventually recumbent, rather closely armed with stout spine-tipped leafy or flower-bearing branchlets; leaf-blades elliptic or ovatish, obtuse, rarely roundish and subcordate at base, entire or rarely denticulate, minutely puberulent, or almost glabrous, 3-nerved from the base, ¼ to ¾ (or 1) inch long; flowers white; panicles simple or subsimple, small, but usually dense, broadly oblong or ovatish, ½ to 1¼ inches long; capsules lobed, nearly 2 lines broad, ridged on the back of each cell.

Openly forested mountain slopes and flats, rarely on naked rocky ridges, 3600 to 8500 feet: Sierra Nevada; high North Coast Ranges; Panamint Range; San Gabriel, San Bernardino and San Jacinto mountains. South to Lower California, north to Oregon, east to Nevada. June-July.

Field note.—Ceanothus cordulatus is a characteristic and abundant species of the Canadian zone. Under the weight of winter snow the main stems of a bush tend to radiate from a central crown and thus form flat or low mound-like plants, though the stems may rise elastically after the snow has melted. Or again individuals may form quite prostrate circles 8 to 15 feet across. The shrubs are frequently spaced, or a cluster of shrubs may form distinct massed colonies 20 to 100 feet in diameter, or again a continuous cover may be developed. The flowers have a heavy or sickly-sweet, sometimes almost suffocating odor.

Locs.—Sierra Nevada: Mt. Shasta near Sisson, *Jepson* 14,010; McCloud, *Jepson;* Mineral, Tehama Co., *Jepson* 12,279; Hot Springs Valley, Lassen Peak, *Jepson;* Warner Valley, Plumas Co., *Jepson* 4065; Gold Run Creek, Susanville, *Jepson;* Soapstone Hill, Plumas Co., *Jepson;* Bear Valley, Nevada Co., *Jepson* 14,008; Donner Lake, *Sonne* 45; Tahoe City, *Jepson* 7725; Mt. Tallac, *Jepson;* Fallen Leaf, Eldorado Co., *Ottley* 849; Pacific Valley, Alpine Co., *Jepson;* Cold Sprs., Amador Co., *Hansen* 192; Dorrington, Calaveras Co., *Jepson;* Belle Mdw., Tuolumne Co., *Jepson* 6474; Leevining Creek, Mono Co., *Ottley* 1089; Sunrise trail, Yosemite, *Jepson* 3164; Mariposa Big Trees, *Jepson;* Bloody Cañon, Mono Co., *Jepson;* Huntington Lake, Fresno Co., *A. L. Grant* 1039; Lake Florence, Fresno Co., *Jepson;* Round Mdw., Giant Forest, *Jepson* 703; Garfield Forest, *Jepson* 4665; Trout Mdw., upper Kern River, *Jepson* 1040; North Fork Middle Tule River, *Jepson.* North Coast Ranges: Grizzly Mt. betw. Hettenshaw Valley and Blocksburg, acc. *Tracy;* Soldier Ridge, near South Yollo Bolly, *Jepson* 14,009; Snow Mt., n. Lake Co., *Purpus* 1153. Desert ranges: Telescope Peak, Panamint Range, *Jepson;* Jackass Spr., Panamint Range, *J. Grinnell.* S. Cal.: Coldwater Cañon, San Antonio Mts., *Peirson* 2277; Round Valley, Mt. San Jacinto, *Jepson* 2317.

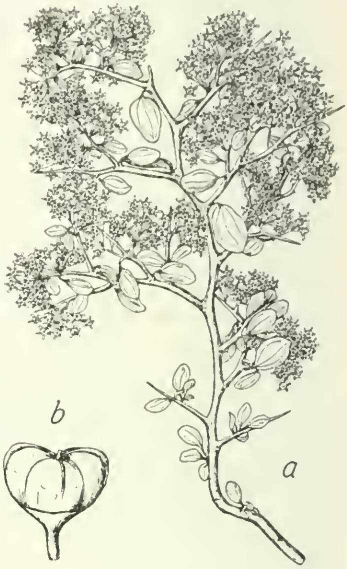

Fig. 234. CEANOTHUS CORDULATUS Kell. *a*, flowering branch, × ½; *b*, capsule, × 4.

Refs.—CEANOTHUS CORDULATUS Kell. Proc. Cal. Acad. 2:124, fig. 39 (1861), type loc. Washoe, Nev., *J. A. Veatch;* Jepson, Fl. W. Mid. Cal. ed. 2, 255 (1911), Man. 622 (1925).

21. **C. incanus** T. & G. MENDOCINO WHITE THORN. (Fig. 235.) Shrub 4 to 8 feet high, with white bark and very glaucous branchlets; branchlets thick, stout and short like bluntish apple tree spurs, or on vigorous shoots slender-spinose; leaf-blades ovate to elliptic or roundish, acute or obtuse, entire (rarely serrulate), rounded at base, 1¼ to 2½ inches long, strongly 3-ribbed from the base, above glabrous and green, often drying dark brown, whitish beneath with a very fine close indument; petioles 2 to 7 lines long; panicles compound, ½ to 1¾ inches long, their axes finely velvety; flowers white; capsules all over thickly warty or wavy-ridged, shallowly lobed at top, 2½ lines in diameter.

Summits of ridges, valley flats or along streams or swales, 400 to 3000 feet: Coast Ranges from southern Humboldt Co. and western Lake Co. to Santa Cruz Co. Apr.-May.

Field note.—Ceanothus incanus has very white bark and glaucous branchlets. It is common in the Redwood belt and reaches its greatest development in Mendocino Co., where it colonizes the summits of ridges and the divides with extensive thickets. In White Thorn Valley, southern Humboldt Co., it has come in extensively in the last two decades in succession to the logged or destroyed woodland.

Locs.—Bull Creek, *Tracy* 6677; South Fork Eel River near Red Mt. Creek, *Jepson* 9418a; Briceland, sw. Humboldt Co., *Jepson* 2149; Leggett Valley (n. of), nw. Mendocino Co., *Jepson;* Jackson Valley, nw. Mendocino Co., *Jepson* 1863; Clarks ranch, nw. of Cahto, Mendocino Co., *Jepson;* betw. Sherwood and Alpine, *Jepson;* Big River headwaters, *Jepson;* Middleton grade, Mt. St. Helena, *Jepson;* Little Sulphur Creek, Sonoma Co., *M. S. Baker;* Lake Merced, San Francisco, *Inez Ray Smith;* Ben Lomond, Santa Cruz Co., *Bergfried* 100; Glenwood, Santa Cruz Mts., *Michener & Bioletti;* Felton, *Elmer* 4253.

Refs.—CEANOTHUS INCANUS T. & G. Fl. N. Am. 1:265 (1838), type from Cal., *Douglas* (doubtless in the Santa Cruz Mts.); Jepson, Fl. W. Mid. Cal. 257 (1901), ed. 2, 254 (1911), Man. 622 (1925).

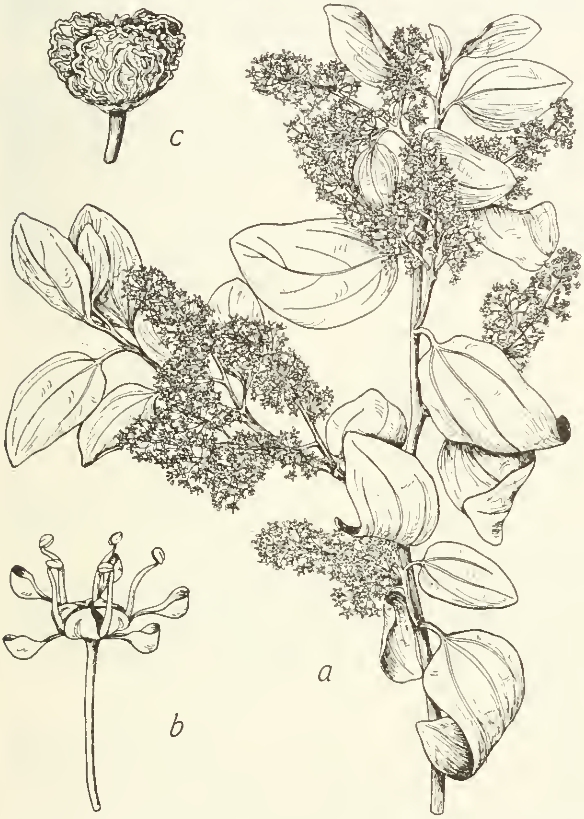

Fig. 235. CEANOTHUS INCANUS T. & G. *a*, flowering branch, × ½; *b*, fl., × 4½; *c*, capsule, × 3.

22. **C. verrucosus** Nutt. BARRANCA BRUSH. Shrub 4 to 8 feet high; leaf-blades roundish-obcordate or deltoid-obovate, commonly retuse or truncate at apex, 4 to 9 lines long, entire or sometimes dentate or denticulate along the sides, green and glabrous above, pale beneath; stipules spreading horizontally, finally large and wart-like, roughening the stems; capsules 2 to 3 lines in diameter, commonly hornless, but variable, sometimes with unequal or with rudimentary horns.

Sandy soil of low hills, 10 to 1000 feet: coastal San Diego Co. South to Lower California. Jan.-Apr.

Locs.—Encinitas, *K. Brandegee* 91; La Jolla, *Jepson* 11,841; San Diego, *Jepson* 6673. Ceanothus verrucosus has been attributed to Pettit Cañon, San Luis Obispo. We regard these shrubs as Ceanothus cuneatus Nutt. They resemble C. verrucosus in their fruits, though no more in other characters than shrubs at many Coast Range stations which are undoubted C. cuneatus.

Refs.—CEANOTHUS VERRUCOSUS Nutt.; T. & G. Fl. 1:267 (1838), type loc. San Diego, *Nuttall;* Jepson, Man. 622 (1925).

23. **C. megacarpus** Nutt. BIG-POD CEANOTHUS. Shrub or tree-like with distinct trunk, 6 to 12 feet high; branches very slender; leaf-blades elliptic-obovate, sometimes varying to cuneate, ½ to 1 (or 1¼) inches long, thickish, entire or rarely retuse or notched at apex, glabrous above, finely and closely tomentose beneath between the straightish parallel veins; flowers white; umbels 1 to several on each short branchlet, only 1 to 3 flowers in each umbel setting fruit; capsules not lobed, 3 to 5 lines broad, provided with stout diverging lateral horns.

Dry rocky hills and cañons, 10 to 2500 feet: near the coast from Santa Barbara Co. to San Diego Co. Jan.-Mar.

Biol. note.—On the main trunks the bark dies above and below a shade-killed branch, resulting in deep longitudinal pockets. There develops also something of the "strand" effect seen in Ceanothus cuneatus, due to the continuous thickening of the wood in longitudinal ridges.

Locs.—Sycamore Cañon, Santa Inez Mts., *Jepson* 9145; Mandeville Cañon, Santa Monica Mts., *Epling;* Santa Cruz Isl., *Jepson* 12,078 (a hornless variety); Santa Catalina Isl. (a hornless variety); Los Angeles, *Davidson;* Claymine Cañon, Santa Ana Mts., *Howell* 2609; San Diego.

Refs.—Ceanothus megacarpus Nutt. N. Am. Sylva 2:46 (1846). *C. macrocarpus* Nutt.; T. & G. Fl. 1:267 (1838), type loc. mts. near Santa Barbara, *Nuttall;* Jepson, Man. 622 (1925); not C. macrocarpus Cav. (1794). *C. cuneatus* var. *macrocarpus* K. Bdg. Proc. Cal. Acad. ser. 2, 4:205 (1894).

24. **C. greggii** Gray. Desert Ceanothus. Very rigid and intricately branched shrub 2 to 4 feet high; leaf-blades grayish-green, oblong to elliptical, acute at both ends or obtuse at apex, entire or sometimes denticulate, puberulent on both faces, 4 to 6 lines long; flowers white; horns of the capsules small, often unequal or rudimentary, spreading from the middle.

Mountain slopes, 4000 to 8000 feet: ranges bordering the Mohave Desert and the Death Valley region. East to New Mexico and south to Mexico. Mar.-May.

Locs.—Gold Hill, Bear Valley, San Bernardino Mts., *Parish* 10,891; Cajon Pass, *Parish* 10,791; Cushenbury Sprs. (Erythea 7:93); San Emigdio, *Eastwood;* Tehachapi Mts., *K. Brandegee;* Jackass Spr., Panamint Range, *J. Grinnell.* Nevada: Charleston Mts., *Purpus* 6092; Mt. Magruder, *Purpus* 5888.

Var. **perplexans** Jepson. Shrub 2 to 5 feet high; leaf-blades obovatish, very thick, spinulose-dentate, yellowish-green, glabrous or puberulent above but minutely papillate beneath with minute white-flocculent dots, 3 to 4 (or 10) lines long; flowers white; capsules with 3 small spreading horns borne on the middle of the lobes or sometimes none.—Dry hills, 3000 to 6000 feet: ranges on west side of the Colorado Desert.

Locs.—Campo, *Parish* 10,812; Monument Peak, Laguna Mts., *Peirson* 5939; Banner grade, Cuyamaca Mts., *C. V. Meyer* 78; Warner Pass, *Jepson* 8533 (leaves less yellowish, 6 to 9 lines long); Warner Ranch, e. San Diego Co., *Jepson* 8532; Palomar Mt., *Munz* 10,409; Vandeventer, Santa Rosa Mts., *Jepson* 1464; Keen Camp, San Jacinto Mts., *Munz* 5448; Santa Ana Cañon, e. San Bernardino Mts., *Hall* 7506 (capsules hornless).

Refs.—Ceanothus greggii Gray, Pl. Wright. 2:28 (1853), based on spms. from Buena Vista, Mex., *Gregg,* and Frontera, N. Mex., *Fendler;* Jepson, Man. 622 (1925). *C. verrucosus* var. *greggii* K. Bdg. Proc. Cal. Acad. ser. 2, 4:208 (1894). *C. vestitus* Greene, Pitt. 2:101 (1890), type loc. Tehachapi, *Greene.* Var. perplexans Jepson, Man. 623 (1925). *C. perplexans* Trel.; Gray, Syn. Fl. 1^1:417 (1897), type loc. "sw. Cal."

25. **C. pinetorum** Cov. Kern Ceanothus. Low-spreading or erect shrub, ½ to 1 or up to 4 feet high; leaf-blades orbicular to elliptic, pungently dentate all around, shining and glabrous above, minutely flocculent beneath, ½ to 1 inch long; flowers blue, sometimes white, in dense umbellate clusters; capsules 3 to 4 lines broad with prominent stout horns 1 to 1½ lines long.

Mountain slopes and ridges, 6500 to 8800 feet: upper Kern River basin. June.

Field note.—This shrub, Ceanothus pinetorum, is nearly related to C. greggii var. perplexans, as represented by such collections of var. perplexans as those from the Banner grade, e. San Diego Co. (*C. V. Meyer* 78), compared with C. pinetorum as it grows on Volcano Creek. It is the only Ceanothus of the opposite-leaved group in the upper Kern River basin. On the talus in Kern Cañon occur prostrate or procumbent forms not over one foot high, though elsewhere it is chiefly erect. Below Coyote Pass it is abundant and it is common from Shotgun Creek to Lion Meadow and Burnt Corral Meadow.

Locs.—Volcano Creek, *Jepson* 963; East Fork Kern Cañon, *Hall & Babcock* 5555; Coyote Pass, *Jepson* 986; Hockett Mdws., *Purpus* 1438; Freeman Creek, Tulare Co., *Jepson* 4881; betw. Cannell and Long mdws., *Hall & Babcock* 5109; Olancha Peak, *Hall & Babcock* 5272.

Refs.—Ceanothus pinetorum Cov. Contrib. U. S. Nat. Herb. 4:80, pl. 6 (1893), type loc. Lion Mdw., Tulare Co., *Coville* 1738; Jepson, Man. 623 (1925). *C. prostratus* var. *pinetorum* K. Bdg. Proc. Cal. Acad. ser. 2, 4:211 (1894).

26. **C. cuneatus** Nutt. Buck-brush. Rigid divaricately and densely branched shrub 4 to 14 feet high, with gray bark; branchlets stout and short, often very unequal and interruptedly disposed; leaf-blades oblong- or cuneate-obovate to

broadly obovate, entire, light green above, paler beneath with a microscopic tomentum and often obscurely quilted, 2 to 7 (or 10) lines long, on very short petioles; umbels ½ to 1 inch broad, borne on short spur-like branchlets; flowers white, with sweetish odor; capsules globose or slightly oblong, 2½ to 3 lines long, with 3 short erect horns near the top.

Dry exposed mountain slopes and ridges and semi-arid valleys, 300 to 4000 feet: throughout cismontane California, especially abundant in the inner Coast Range and Sierra Nevada foothills, less common or infrequent in Southern California. North to Oregon, south to Lower California. Mar.-May.

Field note.—Ceanothus cuneatus is an important constituent of the chaparral association, frequently dominating large areas. On the lower margins of the chaparral belt it often extends out onto dry flats or hills which it colonizes with scattered individuals. In such areas it is often the only woody species. After chaparral fires it crown-sprouts vigorously. The leaves of crown sprouts are usually toothed or spiny-dentate, as are also the leaves of seedlings. In the case of crown sprouts the leaves may occur in threes (Grouse Creek, Tulare Co., *Jepson* 4710). This species also regenerates from roots exposed by landslips or in other ways. On account of the bluish cast of the shrub (apart from the flower) it is called Blue Brush by settlers in the southern Sierra Nevada. The flowers are only rarely bluish. As the lower opposite pairs of branches die, the bark and wood tissue of the main trunk die above and below, forming more or less continuous channels which in some cases eventually result in the longitudinal fissuring of the stem into 2, 3 or 4 separate trunks (cf. fig. 236.).

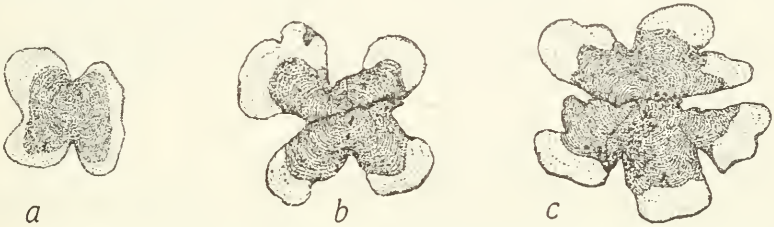

Fig. 236. Ceanothus cuneatus Nutt. In many shrubs of the open colonies in the Sierra Nevada foothills, lethal longitudinal channels are formed below and above pairs of dying or dead decussate branches on the main stem. These increase in length and deepen with age, so that eventually the living tissue is separated into 4, 5 or 6 strands. With the decay of the duramen a single axial stem may be replaced by 2, 3 or 4 distinct stems. *a*, cross sect. of stem, showing the beginning of the channels; *b*, *c*, later stages (cf. Madroño 1:190–192). This phenomenon is doubtless caused by some pathogenic organism.

Locs.—Coast Ranges: Yreka, *Butler* 497, 667; Forks of Salmon, sw. Siskiyou Co., *Jepson;* Anderson, Shasta Co., *Alice King;* Winneshaw, w. Tehama Co., *Jepson;* Hettenshaw Valley, Trinity Co., acc. *Tracy;* Buck Mt., Humboldt Co., acc. *Tracy;* Asa-Bean Ridge, ne. Mendocino Co., *Jepson;* Low Gap, Mendocino Co., *Jepson;* Butts Cañon, n. Napa Co., *Jepson;* Calistoga, e. of, *Jepson* 13,987; Leesville, Colusa Co., *Jepson* 8964; Hoods Peak Range (w. of St. Helena), *Jepson* 13,996; Howell Mt., *Jepson* 2447, 5313; Miller Cañon, Vaca Mts., *Jepson* 13,992; Kenwood, Sonoma Co., *Marie Chase;* Mt. Diablo, *Jepson* 13,993; Cedar Mt., se. Alameda Co., *Jepson;* Mt. Hamilton, *Jepson* 4204; Los Altos, Santa Clara Co., *Jepson* 9102; betw. Gilroy and Corralitos, Santa Cruz Mts., *Jepson* 13,994; Aromas, San Benito Co., *Hickman;* Arroyo Seco, Santa Lucia Mts., *Jepson;* San Antonio Creek, Santa Lucia Mts., *Jepson;* Hernandez Valley, s. San Benito Co., *Jepson* 15,423; Waltham Creek, w. Fresno Co., *Jepson;* Parkfield, e. Monterey Co., *Jepson;* Cantua Creek, sw. Fresno Co., *S. C. Lillis.* Sierra Nevada: Upper Fall River Valley, ne. Shasta Co., *Jepson;* Old Cow Creek, Shasta Co., *Jepson;* Rough & Ready, Nevada Co., *Jepson* 13,989; Gwin Mine, Calaveras Co., *Jepson;* Columbia, *Jepson;* Chinese Camp, *Jepson;* Hetch-Hetchy, *Jepson;* Coulterville, *Jepson;* Wawona, *Jepson;* Rattlesnake Gulch, e. of Friant, Fresno Co., *Jepson;* Watson's Spr., North Fork Kaweah, *Jepson* 578; Three Rivers, *Jepson;* Nelson, Middle Tule River, *Jepson* 4868. Tehachapi Mts.: Rowen, *Jepson* 6737; Bear Mt., *Jepson* 7172. S. Cal.: Sycamore Cañon, Santa Inez Mts., *Jepson;* Mt. Gleason, San Gabriel Mts., *Peirson* 415; San Bernardino, *Parish;* Mt. San Jacinto (Univ. Cal. Publ. Bot. 1:94); Campo, s. San Diego Co. (Bull. N. Y. Bot. Gard. 6:415).

Var. **ramulosus** Greene. Branchlets more numerous, the branches often much elongated; leaves somewhat floccose-tomentose beneath.—Santa Cruz Mts.; Marin Co. to Napa Co.

Locs.—Marin Co., *C. F. Baker* 3162; Calistoga, sw. of, on Rebecca ranch grade, *Jepson* 4022; Franz Valley grade from Calistoga, *Jepson* 13,990.

Refs.—Ceanothus cuneatus Nutt.; T. & G. Fl. 1:267 (1838); B. & W. Bot. Cal. 1:104 (1876); Trel. in Gray, Syn. Fl. 1^1:416 (1897); Jepson, Fl. W. Mid. Cal. 257 (1901), ed. 2, 255 (1911), Man. 623, fig. 622 (1925). *Rhamnus ? cuneatus* Hook. Fl. Bor. Am. 1:124 (1830), type loc. headwaters of the Willamette ("Multnomak") River, Ore., *Douglas*. Var. ramulosus Greene, Fl. Fr. 86 (1891), type loc. Santa Cruz Mts., *Greene;* Jepson, Man. 623 (1925).

27. **C. rigidus** Nutt. Coast Ceanothus. Shrub 3 to 6 feet high, rigidly and intricately branched with numerous often unequal branchlets; leaves rather crowded, the blades cuneate-obovate, mostly retuse, of medium thickness but firm, soon nearly glabrous on both surfaces, the apical half finely dentate or quite entire, 2 to 5 lines long, nearly sessile; stipules conspicuously warty; flowers bright blue; capsules not lobed, 3 lines in diameter, provided with prominent horns

Dry rocky or sandy slopes, 25 to 2000 feet: near the coast from Marin Co. to Santa Barbara Co. Feb.-Apr.

Locs.—Mt. Tamalpais, *Jepson* 6808; Monterey, *Jepson* 2993; Purisima Hills near Lompoc, *Jepson* 11,926. The root tubercles on the root system in this species were first observed by us on Mt. Tamalpais in 1908 (cf. fig. 237).

Refs.—Ceanothus rigidus Nutt.; T. & G. Fl. 1:268 (1838), type loc. Monterey, *Nuttall;* Torr. Bot. Mex. Bound. 45, pl. 9 (1859); Paxton's Fl. Gard. 1:74, fig. 51 (1851); Jepson, Fl. W. Mid. Cal. 258 (1901), ed. 2, 255 (1911), Man. 623 (1925). *C. verrucosus* var. *rigidus* K. Bdg. Proc. Cal. Acad. ser. 2, 4:207 (1894).

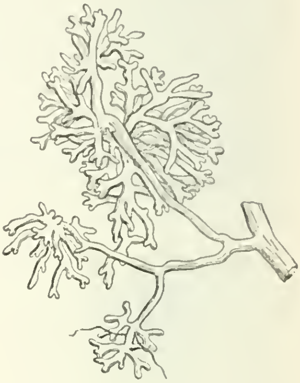
Fig. 237. Ceanothus rigidus Nutt.; root tubercles, × 1½.

28. **C. jepsonii** Greene. Musk-bush. Rigid erect shrub 4 to 5 feet high; branchlets short, rigid, with gray bark; leaf-blades elliptic, coriaceous, green and glabrous above, tomentulose-areolate beneath, spiny-toothed, undulate-margined, or somewhat infolded longitudinally, 4 to 10 lines long; warty stipules small; flowers white or blue, exhaling a musky odor; pedicels 2 to 3 lines long; capsules 2 to 2½ or 3 lines broad, with horns 1½ to 2 lines long.

Dry hills and flats, 1500 to 2500 feet: southeastern Mendocino Co. and northeastern Lake Co. to Napa and Marin Cos. Apr.

Geog. note.—A species of limited distribution, it is most common in the Napa Range and Miyakma Range where its colonies form an important part of the chaparral. It is killed completely by chaparral fires and regenerates only from seed.

Locs.—Red Mt., se. of Ukiah, *Jepson;* ridge betw. Bear and Indian valleys, Lake Co., *Jepson* 8976; Lower Lake (ridge east), *Jepson;* betw. Adams Sprs. and Glenbrook, Lake Co., *Jepson;* Mt. St. Helena (Middleton grade), *Jepson* 10,377; Howell Mt., *Jepson* 2451, 6589; Chiles Creek hills, *Jepson* 6263, 9069.

Var. **purpureus** Jepson. Branchlets brownish or reddish; leaf-blades thick, orbicular, 1 inch long or less, somewhat undulate, coarsely and pungently toothed all around; warty stipules large; flowers large, purple; pedicels 5 to 7 lines long.—Southern Napa Range; Guerneville (leaves nearly plane).

Refs.—Ceanothus jepsonii Greene, Man. Reg. S. F. Bay 78 (1894), type loc. San Geronimo, Marin Co.; Jepson, Fl. W. Mid. Cal. 258 (1901), ed. 2, 255 (1911), Man. 624, fig. 623 (1925). Var. purpureus Jepson, Man. 624 (1925). *C. purpureus* Jepson, Fl. W. Mid. Cal. 258 (1901), type loc. near Mt. George, Napa Co., *Jepson* 14,027; ed. 2, 255 (1911).

29. **C. prostratus** Benth. Mahala Mat. Prostrate plants, the branches thickly matting the ground, often rooting and forming dense mats 2 to 15 feet broad; branchlets often reddish, at first pubescent; leaf-blades green on both surfaces, glabrous or finely flocculent-pubescent beneath, thick and firm, cuneate-obovate, coarsely and pungently 3-toothed at the apex, and often with 1 or 2 similar teeth on each side mostly above the middle, 4 to 9 lines long (or even to 1¼ inches long); flowers blue; capsules globose, not lobed, 3 to 4 lines broad, with 3 large wrinkled horns and 3 intermediate crests.

Pine woods, especially on ridges, 3000 to 7000 feet: Sierra Nevada from Mariposa Co. to Shasta Co.; Lake Co. to Siskiyou Co. North to Washington, east to Nevada. Apr.-May.

Geog. note.—Ceanothus prostratus colonizes extensive areas in the pine woods throughout the northern Sierra Nevada. In the southern Sierra Nevada from Madera Co. to Tulare Co. it is perhaps absent though it has been vaguely reported from Mineral King. In this region it is in the main or wholly replaced by C. diversifolius Kell.

Locs.—Sierra Nevada: Panoche Peak, Mariposa Co., acc. *J. Grinnell;* Yankee Hill, Columbia, *A. L. Grant* 653; Wiley, Amador Co., *Hansen* 59; Forest Hill, Placer Co., *Bolander* 4557; Lake Tahoe, *C. F. Allen;* Donner Lake, *Lemmon;* Sierraville, *Jepson* 8057a; Nevada City, *Michener;* betw. Meadow Valley and Rich Pt., Plumas Co., *Jepson;* Lassen Peak, *Chesnut & Drew;* Gold Run Creek, Susanville, *Jepson;* Fandango Pass, Warner Mts., *Jepson;* Sugar Hill, Davis Creek, Modoc Co., *Jepson;* Forestdale, sw. Modoc Co., *M. S. Baker;* Whitmore, Shasta Co., *Jepson;* upper Fall River Valley, ne. Shasta Co., *Jepson;* Goosenest Mt., e. Siskiyou Co., *Butler* 903. Coast Ranges: Upton, near Sisson, *Jepson* 14,021; Quartz Valley, w. Siskiyou Co., *Butler* 410.

Var. **profugus** Jepson var. n. Prostrate shrub 3 to 7 feet wide; leaf-blades 2 to 3 lines long, cuneatish-oblong, 3-toothed at apex, the lateral teeth minute, cuspidate, the middle one larger, mostly rounded and not cuspidate.—(Frutex prostratus, ped. 3–7 latus; folia lin. 2–3 longa, subcuneato-oblongata, apice 3-dentata, dentibus lateralibus minutis, cuspidatis, dente mediano majore, obtuso non cuspidato.)—Little Red Mt., northern Mendocino Co., in an open forest of Pinus ponderosa and P. lambertiana (*Jepson* 16,505, type).

Var. **divergens** K. Bdg. Low scrambling shrub, the branches horizontally spreading or trailing; leaf-blades strongly dentate-spinose; horns of capsule more lateral.—Mountain slopes, 2000 to 4000 feet: Coast Ranges from Lake Co. to eastern Sonoma Co.

Locs.—Mt. Konocti, *Jepson;* Cobb Mt., *Jepson* 14,039; Mt. St. Helena, *Jepson* 14,036; Rebecca ranch, sw. of Calistoga, *Jepson* 14,037; Hoods Peak, *Michener & Bioletti.*

Var. **grandifolius** Jepson. Leaf-blades ¾ to 1¼ inches long.—Coastal: Pt. Reyes peninsula to Sonoma Co.

Refs.—CEANOTHUS PROSTRATUS Benth. Pl. Hartw. 302 (1848), type loc. "in montibus Sacramento", *Hartweg* 284, that is, northern Sierra Nevada about opposite Chico (cf. Erythea 5:55); Jepson, Fl. W. Mid. Cal. 258 (1901), ed. 2, 255 (1911), Man. 624 (1925). *C. prostratus* var. *laxus* Jepson, Man. 624 (1925), type loc. Hot Springs Valley, Lassen Peak, *Jepson* 4099, a looser form with obovate dentate leaf-blades. Var. PROFUGUS Jepson. Var. DIVERGENS K. Bdg. Proc. Cal. Acad. ser. 2, 4:210 (1894); Jepson, Man. 624 (1925). *C. divergens* Parry, Proc. Davenp. Acad. 5:173 (1889), type loc. near Calistoga, *Parry.* Var. GRANDIFOLIUS Jepson, l.c. *C. rigidus* var. *grandifolius* Torr. Pac. R. Rep. 4:75 (1857), type loc. Pt. Reyes, *Bigelow. C. verrucosus* var. *grandifolius* K. Bdg. Proc. Cal. Acad. ser. 2, 4:207 (1894).

30. **C. fresnensis** Dudley. FRESNO MAT. Procumbent or semi-prostrate, forming circular mats 7 to 10 feet across, the stems thick; leaf-blades narrow-obovate, more or less toothed at the truncatish apex, thinly woolly above, below with a minute quilted felt, 2 to 4 (or 5) lines long; flowers blue; capsules 2 lines long; horns slender.

Mountain ridges, 4500 to 6800 feet: Tuolumne Co. to Fresno Co. May.

Field note.—Ceanothus fresnensis has been little studied but as a species it seems deficient in technical character. Its habit is, however, so pronounced that as a result of field studies we here describe it as a natural unit. It would appear that only a few individuals have been observed in a locality and the known localities in the Yellow Pine belt, which are very few, have all been discovered in the region between the Stanislaus River and the North Fork Kings River. It is therefore a well localized form. It grows at a higher altitude than Ceanothus cuneatus and is often an associate of C. cordulatus.

Locs.—Confidence, Tuolumne Co. (Bot. Gaz. 53:68); near Mariposa Big Trees, acc. *Hopping;* Fresno Big Trees, *Jepson* 15,987; Big Creek, Fresno Co., *Hopping.* Shrubs at French Mdws. (*L. S. Smith* 2631) and Onion Creek (*L. S. Smith* 2632), Placer Co., may possibly be referred here when better known.

Refs.—CEANOTHUS FRESNENSIS Dudley; Abrams, Bot. Gaz. 53:68 (1912), type loc. Mt. Stevenson, Pine Ridge, Fresno Co., *Hall & Chandler* 407. *C. rigidus* var. *fresnensis* Jepson, Man. 623 (1925).

31. **C. crassifolius** Torr. WHITE-BACK CEANOTHUS. Much-branched shrub 3 to 11 feet high; leaf-blades thick and coriaceous, elliptic, ½ to 1½ inches long, shortly petioled, dentate with the margin strongly infolded between the small teeth, or the teeth quite concealed by the strongly revolute edge, rarely entire, the upper surface light green, minutely roughened, the lower surface densely white-

tomentose, more or less concealing the straight lateral veins; flowers white; capsules not lobed, 3 lines broad, provided with stout or minute horn-like crests.

Dry hills, 1000 to 3000 feet: cismontane Southern California from Santa Barbara Co. to San Diego Co. South to Lower California. Jan.-Apr.

Locs.—Santa Inez Mts., *Brewer* 295; Newhall, *K. Brandegee;* Rubio Cañon, San Gabriel Mts., *Peirson* 302a; Millards Cañon, San Gabriel Mts., *Peirson* 302; Mt. Lowe, *Geo. B. Grant* 147; San Bernardino Valley (e. end), *Jepson* 5567; Beaumont, *Parish* 4104; Palomar, *Jepson* 1531; betw. Foster and Ramona, *K. Brandegee;* San Pasqual grade, *Jepson;* Witch Creek, e. San Diego Co., *Alderson.*

Refs.—Ceanothus crassifolius Torr. Pac. R. Rep. 4:75 (1857), type loc. Cajon Pass, *Bigelow;* Torr. Bot. Mex. Bound. 46, pl. 11 (1859); Jepson, Man. 624 (1925). *C. verrucosus* var. *crassifolius* K. Bdg. Proc. Cal. Acad. ser. 2, 4:108 (1894). *C. crassifolius* var. *planus* Abrams, Bull. N. Y. Bot. Gard. 6:415 (1910), type loc. Red Reef Cañon, Topatopa Mts., Ventura Co., *Abrams & McGregor* 124; Jepson, Man. 624 (1925). *C. insularis* Eastw. Proc. Cal. Acad. ser. 4, 16:362 (1927), type loc. Santa Cruz Isl., *A. Swain.*

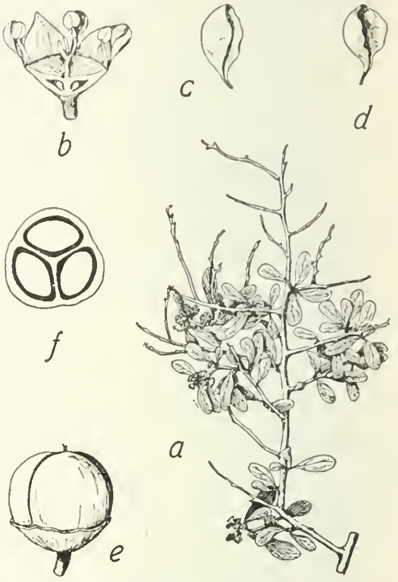

Fig. 238. Colubrina texensis Gray. *a*, fl. branchlet, × ⅓; *b*, long. sect. of fl., × 5; *c*, petal in early anthesis, × 10; *d*, petal in full anthesis, × 10; *e*, capsule, × 2; *f*, cross sect. of ovary, × 5.

4. **COLUBRINA** Rich.

Shrubs or trees with rigid divaricate branches. Leaves alternate. Flowers small, tomentose, in axillary umbels. Calyx-lobes deciduous, herbaceous, the tube adherent to the ovary. Petals small, sessile, hooded or cupped. Style (in ours) 3-divided. Fruit 3-celled, dry, partly inferior, at length splitting into 3 carpels.—Species 16, all continents save Europe, also Hawaiian Isls. (Latin coluber, a serpent, the application unknown.)

1. **C. texensis** Gray. (Fig. 238.) Intricately branched shrub 4 to 7 feet high; branchlets subspinose; young shoots densely and finely tomentose; leaf-blades elliptic to oblong-obovate, puberulent, entire or serrulate, 4 to 9 lines long, the petioles ½ to 1½ lines long; umbels subsessile, 2½ to 3 lines wide, often congested towards the ends of the branchlets, thus forming a somewhat spicate inflorescence; flowers 1½ to 2½ lines wide; calyx tomentose; petals yellow; capsules globose, 3 lines high.

Washes, benches or hillslopes, 800 to 1500 feet: Eagle Mts., north side of Colorado Desert. East to Arizona and Texas, south to Mexico and Lower California. Apr.-May, fr. June.

Geog. note.—The diversity of form of Colubrina texensis, as it occurs in western Texas, is such that it seems to comprehend rather readily within the limits of its variation our shrub of the Eagle Mts. (*Clary* 935).

Refs.—Colubrina texensis Gray, Jour. Bost. Soc. Nat. Hist. 6:169 (1850). *Rhamnus texensis* T. & G. Fl. 1:263 (1838), type from Texas, *Drummond* 67. *C. californica* Jtn. Proc. Cal. Acad. ser. 4, 12:1085 (1924), type loc. Las Animas Bay, L. Cal., *Johnston* 3496.

5. **ADOLPHIA** Meisn.

Rigid oppositely branched shrubs with numerous thorny branchlets obscurely jointed at base. Leaves opposite, petioled, stipulate, falling early. Flowers few in axillary clusters or only one. Petals strongly hooded. Ovary 3-celled, free from the calyx; style often jointed at or near the ovary, the portion above the joint deciduous; stigma 3-lobed. Capsule 3-celled, 3-lobed, the lower one-third surrounded by but mostly free from the persistent cup-like calyx.—Species 2, California and Mexico. (Adolphe T. Brongniart, 1801-1876, French botanist who monographed the family Rhamnaceae.)

1. **A. californica** Wats. Two to 3 feet high; branchlets short, thorn-like, divaricately spreading; younger parts finely pubescent; leaf-blades oblong or obovate, entire or nearly so, 1 to 3 lines long, shortly petioled; flowers 1 to 4 in a cluster, the pedicels 1 line long or in fruit 3 to 4 lines long; calyx greenish-white; petals minute, white; disk dull green; capsule 2 to 3 lines broad; seeds smooth, 2 lines long.

Dry hills and flats, 75 to 2000 feet: western San Diego Co. South to Lower California. Feb.-Mar.

Locs.—San Diego, *R. W. Sumner;* Chollas Valley, *Orcutt;* Penasquitas ranch, *Parish* 4432; Sweetwater Dam, *Geo. B. Grant* 1237.

Refs.—ADOLPHIA CALIFORNICA Wats. Proc. Am. Acad. 11:126 (1876), type loc. Soledad and Chollas Valley, near San Diego, *Parry, Cleveland;* Jepson, Man. 625, fig. 624 (1925).

VITACEAE. VINE FAMILY

Woody plants, mostly climbing by tendrils. Leaves in ours simple, alternate. Flowers small, regular, greenish or whitish, in a compound thyrse. Calyx minute, the limb mostly obsolete and truncate. Petals 5 (4 or 6), valvate, caducous or early deciduous, the stamens as many and opposite them. Fruit a 2-celled berry. Seeds with a thick and bony testa. Embryo minute, in a tough endosperm.—Genera 11, species 600, all continents, chiefly tropical.

Bibliog.—Engelmann, Geo., True grape-vines of the U. S. (Collected Works, 414–426,—1887). Adkinson, J., Some features of the anatomy of the Vitaceae (Ann. Bot. 27:133,—1913).

1. VITIS L. GRAPE

Leaves opposite the tendrils or flower clusters. Tendrils at least once branched. Calyx-tube filled with the disk, which bears the stamens and petals. Ovules 2 in each cell.—Species 28, all continents but chiefly north temperate and subtropical. (Classical Latin name.)

Young shoots and young leaves mostly green, only thinly arachnoid-tomentose or pubescent; berries purple, very glaucous........1. *V. californica.*
Young shoots and young leaves densely white-tomentose; berries black, only slightly glaucous...... 2. *V. girdiana.*

1. **V. californica** Benth. CALIFORNIA GRAPE. Stems 5 to 80 feet long; leaf-blades roundish, pubescent or thinly arachnoid-tomentose, especially beneath, the tomentum in age flocculent, 2 to 8 inches broad, coarsely or minutely dentate, cordate at base with open or closed sinus, slightly or not at all lobed, or sometimes a 3 to 5-lobed leaf with narrow sinuses at the next node above or below an unlobed one; petals and stamens 5; fruit purple, with a bloom, 3 to 5 lines in diameter.

Along streams in valleys and cañons, 5 to 3700 feet: Coast Ranges from Siskiyou Co. to San Luis Obispo Co.; Great Valley; Sierra Nevada foothills from Shasta Co. to Kern Co. North to the Umpqua Valley, Oregon. May-June.

Habital note.—This vine climbs oaks or other trees and shrubs to the height of 10 to 80 feet or more. In some cases its foliage may so completely enshroud the crown as to kill the supporting tree. While usually climbing trees, Vitis californica is sometimes found on bare flats where it forms trailing vines 8 to 15 feet long. In some such places the arboreous growth has been destroyed by fire while the vines have persisted. (Cf. Jepson, Silva 416, pl. 66,—1910.)

Locs.—Coast Ranges: Shasta River near mouth, *Butler* 1029; betw. Dunsmuir and Castle Rock sta., *Jepson;* Kennett, Shasta Co., *Jepson;* Bluff Creek, Klamath River, n. Humboldt Co., *Tracy* 6109; DeVoy Flat, South Fork Eel River, Humboldt Co., *Jepson* 9463; Grindstone Creek, w. Glenn Co., *Jepson* 16,310; Cummings, n. Mendocino Co., *Davy* 5302; Longvale, Mendocino Co., *Jepson;* South Mill Creek, Ukiah, *Jepson* 2414; Hough Sprs., ne. Lake Co., *Jepson;* Scott Valley, Lake Co., *Jepson;* St. Helena, *Jepson* 9841; Miller Cañon, Vaca Mts., *Jepson* 13,936; Mitchell Cañon, Mt. Diablo, *Jepson;* Niles, *Jepson;* Aquarius Spr., Mt. Hamilton, *Jepson;* San Luis Obispo, *Miles.* Great Valley: Crane Creek, w. Tehama Co., *Jepson;* Princeton, Colusa Co., *Davy*

4284; lower Sacramento River islands (Erythea 1:242); Visalia, *Jepson*. Sierra Nevada foothills: Old Cow Creek near Whitmore, Shasta Co., *Jepson* 10,668; Lamoine, Shasta Co., *Blankinship;* Pentz, Butte Co., *Heller* 10,761; Little Chico Creek, Butte Co., *R. M. Austin;* Belden, Plumas Co., *Jepson;* Rich Pt., Middle Fork Feather River, *Jepson;* Oroville, *H. E. Brown* 118; Ione Valley, Amador Co., *Jepson* 9966; Gwin Mine, Calaveras Co., *Jepson;* Harmon Peak, Calaveras Co., *Davy* 1425; Columbia, Tuolumne Co., *Jepson* 6440; Hetch-Hetchy, *Jepson;* Mariposa, *Congdon;* North Fork Kaweah River, *Jepson*. Tehachapi Mts.: Tejon ranch (Contrib. U. S. Nat. Herb. 4:80).

Refs.—VITIS CALIFORNICA Benth. Bot. Sulph. 10 (1844), type loc. lower Sacramento River, *Hinds;* Jepson, Fl. W. Mid. Cal. 259 (1901), ed. 2, 256 (1911), Man. 625, fig. 625 (1925).

2. **V. girdiana** Munson. DESERT GRAPE. Stems 5 to 20 feet long; leaf-blades round-cordate, 2 to 5 inches wide, irregularly dentate, or more commonly prominently lobed, the lobes typically contracted at base; upper side of leaf-blades glabrate and green, under side arachnoid-pubescent; petals and stamens 6; berries black, slightly glaucous, 2 to 3 lines in diameter.

Cañon bottoms, about springs and along streams, 300 to 4200 feet: Inyo Co.; Mohave Desert: coastal Southern California from the San Gabriel Range to San Diego Co.; mountains of the Colorado Desert. South to Lower California. May.

Locs.—Texas Spr., Funeral Mts., *Jepson* 6880; Hanaupah Cañon, Panamint Mts., *Jepson* 7099; Newberry, acc. *J. H. Manson;* San Bernardino, *Parish;* Cajon Pass, *Jepson;* Monrovia Cañon, San Gabriel Mts., *Peirson* 442; Santa Catalina Isl. (Erythea 7:140); Riverside, *Jepson;* Bonsall, n. San Diego Co., *Wiggins* 3050; San Diego, *Mary F. Spencer* 161; Jamacha, *Chandler* 5261; Grapevine Spr., e. San Diego Co., *Jepson*.

Refs.—VITIS GIRDIANA Munson, Proc. Soc. Prom. Agr. Sci. 8:59 (1887), "San Diego Co."; Jepson, Man. 625 (1925).

MALVACEAE. MALLOW FAMILY

Herbs or soft-woody shrubs with mucilaginous juice, tough fibrous inner bark, and usually stellate pubescence. Leaves alternate, simple, stipulate, the blades palmately veined and commonly palmately lobed. Flowers commonly perfect, sometimes polygamous or dioecious, regular. Calyx with 5 lobes, valvate in the bud, often with an involucel of bractlets at base. Petals 5, twisted in the bud. Stamens indefinite, hypogynous, monadelphous in a column or tube around the pistils, the petals inserted on the base of the tube. Pistil 1, composed of several to many carpels, the superior ovary commonly with as many cells as styles or stigmas. Fruit a loculicidal capsule, or composed of a circle of united carpels separating at maturity.—Genera 32, species 850, all continents.

Bibliog.—Bentham, Geo., Notes on Malvaceae (Jour. Linn. Soc. Bot. 6:97–110,—1862). Gray, A., Malvaceae in Plantae Fendlerianae (Mem. Am. Acad. 4:15–25,—1849); Malvaceae [of N. Am.] (Proc. Am. Acad. 22:285–303,—1887); Malvaceae in Syn. Fl. 1^1:294–338,—1897. Greene, E. L., Sidalcea: a synopsis of the species (Bull. Cal. Acad. 1:74–80,—1885); Certain malvaceous types (Lflts. 1:205–209,—1906); Manipulus Malvacearum (Cyb. Columb. 1:33–36,—1914). Baker, E. G., Synopsis of genera and species of Malveae (Jour. Bot. 28:15–18, 140–145, 207–213, 239–243, 339–343, 367–371,—1890; 29:49–53, 164–172, 362–366,—1891; 30:71–78, 136–142, 235–240, 290–296, 324–332,—1892; 31:68–76, 212–217, 267–273, 334–338, 361–368,—1893; 32: supplem. 35–38,—1894). Davidson, A., Malvastrum splendidum Kell. (Erythea 4:68–69,—1896). Bergman, H. F., Comments on Malva rotundifolia L. and its allies (Minn. Bot. Stud. 4:437–442, pls. 47–48,—1916). Estes, F. E., The shrubby Malvastrums of S. Cal. (Bull. S. Cal. Acad. 24:81–87,—1925). Roush, E. M. F., Monograph of the genus Sidalcea (Ann. Mo. Bot. Gard. 18:117–244, pls. 1–13,—1931).

Anthers scattered along the outside of the tube of filaments; carpels or cells of the ovary 5 to 8.
  Involucel consisting of 3 to many distinct slender bractlets; stigmas capitate; fruit a loculicidal capsule..........1. HIBISCUS.
  Involucel broadly 2 to 3-lobed; styles stigmatic lengthwise; fruit a depressed whorl of smooth carpels..........2. LAVATERA.
Anthers borne in a cluster at the top of the tube of filaments; carpels several, crowded and united around a central axis, separating at maturity.
  Styles stigmatic lengthwise on the inside; herbs.
    Bractlets 3, distinct, inserted on the calyx..........3. MALVA.
    Bractlets none or one and inserted on base of calyx..........4. SIDALCEA.
  Styles with a terminal or capitate stigma.

Bractlets slender or even filiform.
  Flowers cream-color; low decumbent herb........5. SIDA.
  Flowers roseate, rose-purple, yellow or white; shrubs or herbs.
    Carpels with 2 ovules, the ovules separated by transverse partitions; herbs........6. MODIOLA.
    Carpels with 1 to 3 ovules, without transverse septa; shrubs or herbs........7. SPHAERALCEA.
Bractlets none.
  Carpels separating at maturity, the lower portion reticulate in fruit; corolla salmon-color; calyx erect in fruit........8. HORSFORDIA.
  Carpels remaining united and forming a capsule, not reticulate in fruit; corolla (in ours) pink; calyx (in ours) reflexed in fruit........9. ABUTILON.

1. HIBISCUS L. ROSE-MALLOW

Stout herbs or shrubs. Flowers showy, in ours solitary. Involucel consisting of several to many slender bractlets. Stamen-column with anthers scattered along the upper part but naked at the truncate 5-toothed summit. Ovary 5-celled with 2 to many ovules in each cell. Capsule loculicidal.—Species 175, all continents, mostly tropical. (Greek name for the Marsh Mallow, used by Dioscorides.)

Leaf-blades cordate; peduncles subterminal, 2 to 3 inches long, jointed near the middle, united with the petiole at base; calyx cleft to the middle; seeds globose, glabrous, minutely papillate........1. *H. californicus.*
Leaf-blades ovate; peduncles mostly axillary, 1 to 9 lines long; calyx cleft nearly to the base; seeds reniform, densely silky........2. *H. denudatus.*

1. **H. californicus** Kell. DELTA ROSE-MALLOW. Stems pubescent, cane-like, 3 to 7 feet high; leaf-blades cordate, dentate, acuminate, 2½ to 4 inches long; petioles 1½ to 2¼ inches long; calyx campanulate, cleft to the middle, conspicuously nerved at maturity and filled by the capsule; corolla white or roseate, with deep crimson center, 2½ to 4 inches long; capsule 1 to 1⅛ inches long.

Low marshy places, 5 to 50 feet: lower Sacramento and San Joaquin rivers. Aug.-Sept.

Locs.—Stockton, *W. P. Gibbons;* Middle River, *Jepson* 5696; Moorland, San Joaquin Co., *R. M. Filcher;* Rio Vista, *Jepson* 14,049.

Refs.—HIBISCUS CALIFORNICUS Kell. Proc. Cal. Acad. 4:292 (1872), type loc. Webbs Ldg., San Joaquin River, *C. D. Gibbs;* Jepson, Fl. W. Mid. Cal. 237 (1901), ed. 2, 257 (1911), Man. 626 (1925).

2. **H. denudatus** Benth. PALE FACE. Stems slender, woody at base, somewhat flexuose above, 1 to 2½ feet high; herbage densely and closely tomentose; leaf-blades ovate, serrulate, ½ to 1 inch long, short-petioled; flowers short-peduncled in the axils and along the somewhat naked flexuose summit of the branches; calyx 5-parted, canescent-tomentose; bractlets 3 to 7, setaceous, commonly less than half as long as the calyx or almost obsolete; petals white or pale lavender, often with a narrow rose band in center, ½ to 1 inch long; capsule acute, dehiscent to the base, shorter than the calyx.

Dry cañons and desert valleys, 100 to 1000 feet: Colorado Desert. East to Texas, south to Lower California. Mar.-Apr.

Locs.—Chuckwalla Wash, Riverside Co., *Schellenger* 106; Chino Cañon, Palm Sprs. of San Jacinto, *M. F. Gilman* 28; Devils Cañon, Santa Rosa Mts.; Palm Cañon of San Ysidro, *Jepson* 8812; Yaqui Well, ne. San Diego Co., *Jepson* 12,515; Signal Mt., *Abrams* 3178.

Refs.—HIBISCUS DENUDATUS Benth. Bot. Sulph. 7, pl. 3 (1844), type loc. Magdalena Bay, L. Cal., *Hinds;* Jepson, Man. 626 (1925).

2. LAVATERA L.

Ours shrubs with ample maple-like leaves and small caducous stipules. Flowers showy, axillary, subtended by a 2 to 3-lobed involucel. Pedicels jointed above the middle. Petals reflexed after anthesis, truncate or retuse, long-clawed. Styles 5 to 8. Fruit a depressed whorl of smooth 1-seeded carpels.—Species 20, mostly

Mediterranean (Europe, Asia, Africa), 1 in Australia, 1 in California and 3 in Mexico. (Two brothers Lavater, Swiss physicians and naturalists.)

Bibliog.—Lyon, W. S., Notes on Lavatera (Bot. Gaz. 11:202–205,—1886). Brandegee, T., Lavatera assurgentiflora Kell. (Zoe 1:109,—1890); Lavatera—is it an introduced plant? (Zoe 1:188–190,—1890). Parish, S. B., The Pacific Lavateras (Zoe 1:300–301,—1890). Trask, B., [Note on Lavatera assurgentiflora] (Erythea 7:140,—1899).

1. **L. assurgentiflora** Kell. Tree Mallow. Shrub 4 to 10 feet high; leaf-blades palmately 5-lobed and dentately toothed; calyx-lobes triangular, acute, shorter than the tube; corolla 1½ to 2¼ inches broad, the petals rose-color with darker veins; claws bearded at base.

Sandy flats or rocky islets: Santa Barbara Islands. Apr.-Aug.

Historical note.—From a very early day Lavatera assurgentiflora was reported as occurring on Anacapa Island, one of the smaller islands of the Santa Barbara archipelago. It also occurs on Bird Island, a sea rock near Santa Catalina Island (Erythea 7:140), on Santa Catalina Island itself, on San Miguel Island (Greene), and on Santa Cruz and San Clemente islands (Zoe 1:109). When this species was first known these islands represented wild and unfrequented habitats. In view, further, that Lavatera assurgentiflora has not been identified as conspecific with any Old World species we here regard it as unquestionably native. It is not found on the California mainland as an indigenous plant, nor southward. On the islands off the Lower California coast occur three other species closely related to it, namely: Lavatera insularis Wats. on Coronados Islands; Lavatera occidentalis Wats. on Guadalupe Island; Lavatera venosa Wats. on San Benito Island. These species, also, we judge to be endemics. T. S. Brandegee, on the contrary, by virtue of verbal tradition derived from Spanish-Californians, contends that all these Lavateras were brought from Spain or the Mediterranean region by the Franciscan missionaries (Zoe 1:188). This contention necessitates that the Franciscans, who were not botanists, but missionaries and cultivators of the soil engaged in subduing the native tribes of California, went out into the sea and planted one Lavatera species and no more on each of four islands or island groups scattered over a distance of seven hundred miles along the coast,—islands uninhabited and remote, islands having no connection or probable interest with the daily work of the friars on the mainland, islands even to this day, in many cases, difficult of approach or of easy landing. A clear statement of such a theory carries its own refutation. Compare the convincing paragraph by S. B. Parish (Zoe 1:300–301).

By 1853 or perhaps before, Lavatera assurgentiflora was brought to the mainland gardens and during the years has come into some economic importance for use as a hedge windbreak for vegetable gardens in the region of San Francisco Bay. It is often seen in cultivation from Mendocino Co. to San Diego but has never become truly naturalized. In 1908 we observed two forms growing side by side in the garden of Blanche Trask at Avalon, Santa Catalina Island; the form from San Clemente Island showed much larger and lighter green leaves (*Jepson* 14,050) than the form of Santa Catalina Island.

Refs.—Lavatera assurgentiflora Kell. Proc. Cal. Acad. 1:14 (1854), type loc. Anacapa Isl.; Jepson, Fl. W. Mid. Cal. 237 (1911), ed. 2, 257 (1911), Man. 627 (1925). *Althaea assurgentiflora* Ktze. Rev. Gen. Pl. 1:66 (1891). *Saviniona assurgentiflora* Greene, Lflts. 2:163 (1911). *S. clementina* Greene, l.c. 2:160 (1911), type loc. San Clemente Isl., *Trask*. *S. reticulata* Greene, l.c. 161, type loc. Santa Catalina Isl., *Trask*. *S. dendroidea* Greene, l.c., type loc. San Miguel Isl., *Greene*. *S. suspensa* Greene, l.c. 162, type loc. San Diego, *Vasey*.

3. MALVA L. Mallow

Ours annuals or biennials. Involucre of 3 distinct bractlets, inserted on the base of the calyx. Calyx cleft to the middle into 5 broad lobes. Petals whitish or rose-color, obcordate or emarginate. Style-branches 7 to 10, subulate. Fruit circular and flattish, splitting up when ripe into about 6 to 15 carpels or nutlets. Nutlets round-reniform, 1-seeded.—Species 25, Europe, Asia and Africa. (Greek malache, soft, on account of the emollient properties.)

Petals much surpassing the calyx; calyx-lobes mostly closed over the mature fruit.
  Carpels not reticulate or only obscurely, hirsutulous on back, the margins rounded.................... 1. *M. rotundifolia.*
  Carpels rugose-reticulate on back, glabrate at maturity, the margins sharply angled and entire or obscurely denticulate..........2. *M. nicaeensis.*
Petals equaling or slightly longer than the calyx; carpels rugose-reticulate and thinly pubescent on back, the margins narrowly winged and denticulate; calyx-lobes spreading or erect.... 3. *M. parviflora.*

1. **M. rotundifolia** L. Dwarf Mallow. Stems slender, procumbent, 1 to 2 feet long, from a large deep root; herbage sparsely hirsute or hirsutulous, or the

young parts stellate-pubescent; leaf-blades rounded, crenate, slightly or scarcely at all 5 to 7-lobed; corolla surpassing the calyx, pale blue, 4 to 7 lines long, 3 to 4 times as long as the calyx; carpels 14 or 15, hirsutulous or in age glabrate, not reticulated on the back or only slightly, the margins rounded; calyx enclosing the fruit.

Naturalized from Europe, waysides and old gardens, 5 to 4000 feet: northern and central California. May-Oct.

Locs.—Yreka, *Butler* 1028; Little Hot Springs Valley, Modoc Co., *Baker & Nutting;* Surprise Valley, Modoc Co., *Jepson* 7852; Meadow Valley, Plumas Co., *Jepson* 10,640; Ft. Ross (Erythea 6:26); San Francisco, *Tinsley* 13; Berkeley, *Jepson* 14,054; Mariposa, *Congdon.*

Refs.—MALVA ROTUNDIFOLIA L. Sp. Pl. 688 (1753), type from Europe; Jepson, Fl. W. Mid. Cal. 238 (1901), ed. 2, 258 (1911), Man. 627 (1925).

2. **M. nicaeensis** All. BULL MALLOW. Stems erect or spreading, ½ to 2 feet high; herbage thinly bristly or hirsute with spreading hairs; leaves like no. 1; pedicels tending to be reflexed in fruit; bractlets ovate or lanceolate; corolla pinkish, 5 to 6 lines long, 2 to 3 times as long as the calyx; carpels 7 to 9, scantily puberulent or in age glabrate, dorsally rugose-reticulate or even somewhat favose, the margin entire or slightly denticulate; calyx-lobes mostly closely valvate over the fruit.

Naturalized from Europe, waste ground about towns, 5 to 1000 feet: cismontane valleys. May-Sept.

Locs.—Willows, Glenn Co., *Davy* 4276; Stockton, *Sanford;* Berkeley, *Jepson* 10,389a; Alviso, Santa Clara Co., *Jepson* 10,399; San Bernardino Mission, *Parish* 2057.

Refs.—MALVA NICAEENSIS All. Fl. Pedem. 2:40 (1785), type European. *M. borealis* Jepson, Fl. W. Mid. Cal. 258 (1901), ed. 2, 238 (1911), Man. 627, fig. 626 (1925); not M. borealis Wallm. (1798).

MALVA SYLVESTRIS L. Sp. Pl. 689 (1753), type from Europe. High Mallow. Corolla mauve or reddish-purple, 1 to 1½ inches wide.—Adventive from Europe: Guerneville, *Davy* 2964; Rawhide, Tuolumne Co., *Williamson.*

3. **M. parviflora** L. CHEESE-WEED. Stem widely branching, usually erect, 1 to 3 feet high; petioles and ascending branches more or less stellate-hairy on the upper side, glabrous below; leaf-blades roundish in outline, with a red spot at base of blade, shallowly 7-lobed, 1 to 5 inches wide, on petioles more than twice as long as the blade; flowers in rather close axillary clusters; bractlets linear; corolla pinkish with notched petals, 2½ lines long, equaling or slightly longer than the calyx; calyx commonly spreading under or about the mature fruit; carpels about 11, sharply rugose-reticulate and pubescent on the back, the margin very narrowly winged and denticulate.

Naturalized from Europe, gardens and waste lands, 5 to 5000 feet: throughout California. June-Nov.

Locs.—Eureka, *Tracy* 4518; Marysville Buttes, *Jepson* 14,051; Truckee, *Sonne;* Vacaville, *Jepson* 14,055; Berkeley, *Greene;* San Luis Obispo, *Summers* 100; Farmersville, Tulare Co., *L. C. Watson;* Tajiguas, Santa Barbara Co., *Jepson* 11,914; Los Angeles, *Ewan* 4188; Pomona, *Davy* 2853; San Bernardino, *Parish;* San Diego, *J. G. Cooper* 435.

Refs.—MALVA PARVIFLORA L. Amoen. Acad. 3:416 (1787), type from Europe; Greene, W. Am. Sci. 3:155 (1887); Jepson, Fl. W. Mid. Cal. 258 (1901), ed. 2, 238 (1911), Man. 627 (1925).

4. **SIDALCEA** Gray. CHECKER

Herbs. Leaf-blades rounded, either crenate, crenately incised, parted or divided, or palmately lobed, petioled. Flowers in terminal spikes or racemes, either perfect, gynodioecious (that is, with perfect and pistillate flowers on separate plants, the pistillate flowers being smaller and with sterile stamens) or dioecious. Corolla purple, rose-pink or white. Bractlets none, rarely 1. Petals emarginate or truncate. Stamen-tube with double series of terminal free filaments, the filaments of the outer series often distinctly below the filaments of the inner series;

filaments more or less united into sets. Fruit consisting of 5 to 9 carpels, the carpels 1-seeded, commonly beaked.—Species 20, western North America. (Sida, a genus of this family, and Alkea, ancient name for a mallow, alluding to the appearance and relationship of these plants.)

A. Leaf-blades orbicular in outline, at least some (usually the upper) pedately parted or divided; flowers usually rose-pink or purple.—Subgenus EUSIDALCEA.

Annuals (except no. 5); spring flowering; stamineal column conspicuously divided into an outer and an inner series.
  Carpels rugose-reticulate or somewhat favose on the back.
    Bracts conspicuous, foliaceous, palmately divided into filiform segments; plants hairy.. 1. *S. diploscypha.*
    Bracts inconspicuous, narrowly linear or oblong and entire.
      Herbage nearly glabrous to sparsely stellate-puberulent; carpels reniform, incurved at maturity; flowers sparse in short racemes; slender plants........................ 2. *S. hartwegii.*
      Herbage more or less densely hirsute; carpels orbicular, not incurved at maturity; spikes densely flowered; stout plants..3. *S. hirsuta.*
  Carpels longitudinally grooved or striately nerved on the back.
    Annual; stipules and bracts broadly to narrowly ovate, acuminate, 1 to 3 lines long........ 4. *S. calycosa.*
    Perennial; stipules and bracts broadly ovate, mostly obtuse, papery and purple-tinged, 4 to 8 lines long..5. *S. rhizomata.*
Perennials; mostly summer flowering; stamineal column with the outer series closely approximating the inner series.
  Stems decumbent, arising from slender rootstocks and rooting at the nodes; mainly Sierra Nevada and Humboldt Co.
    Leaves mainly basal and very long-petioled..6. *S. reptans.*
    Leaves only a few basal, the stems leafy throughout; petioles mostly short..7. *S. asprella.*
  Stems erect or sometimes decumbent, arising from a thick root-crown, not rooting at the nodes.
    Herbage glaucous, often glabrous or subglabrous.
      Blades of lowest leaves for most part crenately toothed or lobed, usually different from the upper; Southern California................................8. *S. neomexicana.*
      Blades of lowest leaves deeply lobed or divided into narrow segments, similar to the upper; Sierra Nevada..9. *S. glaucescens.*
    Herbage not glaucous, usually hirsute or stellate-pubescent, rarely glabrous.
      Stems subscapose; San Bernardino Mts..10. *S. pedata.*
      Stems more or less leafy.
        Flowers in spikes or heads.
          Spikes broad (11 to 16 lines wide), very dense; plants coarse; Humboldt coast...11. *S. eximia.*
          Spikes narrow (7 to 9 or 12 lines wide), sometimes dense, often lax, sometimes interrupted; plants slender; montane, inner ranges............ 12. *S. oregana.*
        Flowers usually in racemes; mainly coastal............................13. *S. malvaeflora.*

B. Leaf-blades suborbicular in outline, none parted or divided; carpels smooth (or nearly so); perennials.—Subgenus HESPERALCEA.

Flowers white, in oblong spikes; plants stout; leaves like those of a grape........14. *S. malachroides.*
Flowers rose-purple, in elongate spicate racemes; plants more slender; leaf-blades suborbicular, serrate or shallowly incised..15. *S. hickmanii.*

1. **S. diploscypha** Gray. CUP SIDALCEA. (Fig. 239.) Stem erect and simple, or more robust and freely branching, 1½ to 2 feet high; herbage pilose-hispid and also with a minute stellate pubescence; blades of basal leaves more or less deeply crenate, ½ to 1½ inches wide, the cauline parted and 2 or 3-cleft, the bracteal filiform-divided; petioles ¾ to 2¼ inches, or the lower to 5½ inches long; flowers on short pedicels in umbellate clusters at the ends of the branches; bracts 4 to 8 lines long; calyx-lobes lanceolate-subulate; petals dark pink, with or without a dark purple center, minutely erose-denticulate, ¾ to 1¼ inches long; filaments of the outer series united nearly to the summit into sets of 5 to 10; carpels nearly orbicular, dorsally reticulated but only lightly.

Open foothills or valley plains, 100 to 3000 feet: Coast Ranges from Humboldt Co. to San Luis Obispo Co.; Sacramento Valley; Sierra Nevada foothills from Shasta Co. to Mariposa Co. Apr.-June.

Locs.—Coast Ranges: Elk Prairie, Humboldt Co., *Davy* 5463; Sherwood Valley, Mendocino Co., *Jepson* 1838; Willits, *Jepson* 2495; Ukiah Valley, *Jepson* 9286; Lakeport, *M. S. Baker;* Venado, w. Colusa Co., *Jepson* 16,260; Knoxville ridge, ne. Napa Co., *Jepson* 9041; Healdsburg, *Jepson* 9295; Pope Creek, Napa Co., *E. Ferguson* 345; Putah Cañon, w. of Winters, *Jepson* 14,078; Dutton Cañon, Vaca Mts., *Jepson* 14,067; Hoods Peak, Sonoma Co., *Michener & Bioletti;* Fairfax, Marin Co., *E. C. Sutliffe;* Newark, Alameda Co., *Davy* 1121; Mt. Hamilton, *W. W. Price;* Morro, San Luis Obispo Co., *Condit.* Sacramento Valley: Vina, Tehama Co., *Heller* 11,336; Cana (e. of), Butte Co., *Jepson* 16,369; College City, Colusa Co., *Alice King;* Marysville Buttes, *Blankinship;* Rumsey, Yolo Co., *C. F. Baker* 2931; Elk Grove, Sacramento Co., *Drew;* Montezuma Hills, se. Solano Co., *Jepson* 14,068. Sierra Nevada foothills and the adjacent rolling plains: Oak Run, Shasta Co., *Baker & Nutting;* Clear Creek, Butte Co., *H. E. Brown;* Milton, San Joaquin Co., *Davy* 1330; Mariposa Co. (Ann. Mo. Bot. Gard. 18:140).

Refs.—SIDALCEA DIPLOSCYPHA Gray; Benth. Pl. Hartw. 300 (1848); Jepson, Fl. W. Mid. Cal. 239 (1901), ed. 2, 259 (1911), Man. 628 (1925). *Sida diploscypha* T. & G. Fl. 1:234 (1838), type from Cal., *Douglas;* H. & A. Bot. Beech. 326, t. 76 (1840). *Sidalcea diploscypha* var. *minor* Gray, Mem. Am. Acad. 4:19 (1849), type from Cal., *Fremont* (flowers smaller, 1½ inches broad, with a darker purple center); Jepson, Fl. W. Mid. Cal. 239 (1901), ed. 2, 259 (1911). *S. secundiflora* Greene, Fl. Fr. 103 (1891), type from the Coast Ranges.

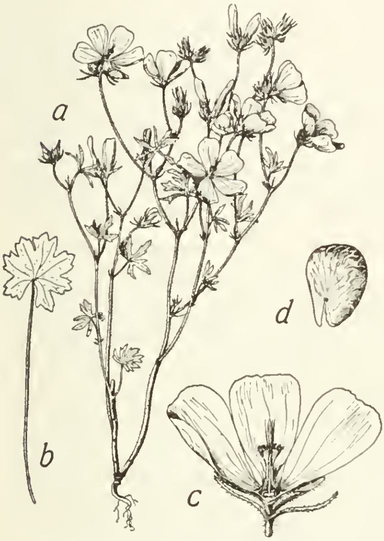

Fig. 239. SIDALCEA DIPLOSCYPHA Gray. *a*, habit, × ⅓; *b*, basal leaf, × ⅓; *c*, long. sect. of fl., × ¾; *d*, nutlet, × 4.

2. **S. hartwegii** Gray. VALLEY SIDALCEA. Stem slender, sparingly branched, 7 to 12 inches high; herbage sparsely stellate-pubescent or almost glabrous below, but scarcely or not at all hispid; leaves with the blades 4 to 12 lines wide, pedately 5 to 7-divided into linear entire divisions or the lower (usually deciduous before flowering) with blades having broader trifid divisions; petioles 3 to 11 lines long; flowers few in a short spike; bracts narrowly linear or lanceolate, 1 to 1½ lines long; calyx finely stellate-pubescent; corolla rose-purple, 6 to 8 lines long; filaments of the outer series of stamens closely approximating the inner, more or less united in pairs or sets as in the perennial species; carpels strongly incurved, alveolate-reticulate.

Dry clay or gravelly hillsides, 25 to 1300 feet: Mendocino Co. to Napa Co.; Sacramento Valley; Sierra Nevada foothills from Shasta Co. to Tulare Co. Mar.-June.

Locs.—North Coast Ranges: Lodoga, w. Colusa Co., *Jepson* 16,278; Potter Valley, Mendocino Co., *Nettie Purpus;* Scott Valley, Lake Co., *Tracy* 1648; Indian Valley, ne. Lake Co., *Jepson* 8987; St. Helena, *Jepson* 14,069. Sacramento Valley: Crane Creek, w. Tehama Co., *Jepson* 14,071; Rio Linda, n. Sacramento Co., *Jepson* 16,586; College City, *Alice King;* Hartley sta., nw. Solano Co., *C. F. Baker* 2877. Sierra Nevada foothills: Burney, Shasta Co. (Ann. Mo. Bot. Gard. 18:149); Little Chico Creek, Butte Co., *Heller;* Auburn, *Shockley;* Gwin Mine, Calaveras Co., *Jepson* 1802; Chinese Camp, Tuolumne Co., *Jepson* 6321; Cathay Valley, Mariposa Co., *Jepson* 12,764; Kings River (Ann. Mo. Bot. Gard. 18:150); Kaweah River, *W. Fry* 156.

Refs.—SIDALCEA HARTWEGII Gray; Benth. Pl. Hartw. 300 (1848), type loc. Sacramento Valley, *Hartweg* 246, more exactly Butte Co. plains (Erythea 5:54); Jepson, Fl. W. Mid. Cal. 239 (1901), ed. 2, 259 (1911), Man. 628 (1925). *S. tenella* Greene, Bull. Cal. Acad. 1:7 (1884), type loc. Little Chico Creek, Butte Co., *R. M. Austin.* *S. hartwegii* var. *tenella* Gray, Proc. Am. Acad. 22:286 (1887).

3. **S. hirsuta** Gray. Wallow Checker. Stem erect, very stout, 1 to 2 feet high, the branches rather strictly ascending and ending in dense spikes; herbage below glabrous or glabrate, the inflorescence rather densely hirsute; blades of cauline leaves palmately or pedately divided into 7 to 9 narrowly linear and entire acute divisions, the divisions 1 to 2 inches long; bracts divided into 2 filiform segments 2 to 4 lines long; spikes 2 to 4 (or 8) inches long; calyx densely cinereous-pubescent and hirsute, the tube somewhat chartaceous; corolla rose-purple, ½ to 1 inch long; petals erect, induplicate; carpels more or less hirsute, orbicular, not incurved at maturity, alveolate-reticulated on the back and tipped at the central apex with a bristly beak.

Low wet but soon desiccated spots, 175 to 900 feet: Sierra Nevada foothills and adjacent plains from Shasta Co. to Merced Co.; eastern Mendocino Co. Apr.-May.

Locs.—Sierra Nevada foothills and adjacent plains: Anderson, Shasta Co., *Alice King;* Chico, *R. M. Austin* 693; Table Mt., Tuolumne Co., *Jepson* 6421; Jenny Lind, San Joaquin Co., *Gunnison;* Merced (Ann. Mo. Bot. Gard. 18:144). Eastern Mendocino Co.: Potter Valley, *Nettie Purpus.*

Refs.—Sidalcea hirsuta Gray, Pl. Wright. 1:16 (1852), type loc. Sacramento Valley, *Hartweg;* Jepson, Man. 629 (1925). *S. delphinifolia* Gray; Benth. Pl. Hartw. 300 (1848), excluding synonym, type loc. Sacramento Valley, *Hartweg* 292. *S. hartwegii* Gray; B. & W. Bot. Cal. 1:84 (1876) in part.

4. **S. calycosa** Jones. Swamp Checker. Stem erect, slender, sparingly branched, 1 to 3 feet high, arising from a creeping rootstock; herbage glabrous or sparsely pubescent with scattered hairs; blades of basal leaves roundish, crenate or crenately incised, ¾ to 1¼ inches wide, long-petioled; blades of cauline leaves divided into 6 or 7 divisions, the divisions oblanceolate to cuneate, entire or 3-toothed; stipules usually purple, the lower ones linear-acuminate, the upper becoming ovate, serrate and scarious; bracts parted into 2 ovate or lanceolate lobes; racemes spicate, few to many-flowered, elongated and loose after anthesis; calyx large, loose, often purple-tinged or scarious, thinly hirsute; corolla light purple, 6 to 10 lines long; carpels striate-ridged on the back, commonly reticulate on the sides, strongly incurved.

Swampy ground, 20 to 1100 feet: Sonoma and Napa counties; Sierra Nevada foothills from Shasta Co. to Calaveras Co. Apr.-July.

Locs.—Coast Ranges just north of San Francisco Bay: Valley Ford, Sonoma Co., *K. Brandegee;* Petaluma, *Congdon;* Napa, *Sonne.* Sierra Nevada foothills: Welch's, Shasta Co., *M. S. Baker* 453; Clear Creek, Butte Co., *Heller* 11,381; Table Mt., Oroville, *Heller* 10,751; Sweetwater Creek, Eldorado Co., *K. Brandegee;* Salt Springs Valley, Calaveras Co., *Tracy* 5645.

Refs.—Sidalcea calycosa Jones, Am. Nat. 17:875 (1883), type loc. Duncans Mills, Sonoma Co., *Jones;* Jepson, Fl. W. Mid. Cal. 240 (1901), ed. 2, 259 (1911), Man. 629 (1925). *S. sulcata* Curran; Greene, Bull. Cal. Acad. 1:79 (1885), near Folsom, Sacramento Co. and on Sweetwater Creek, Eldorado Co., *Curran;* Jepson, Fl. W. Mid. Cal. 240 (1901), ed. 2, 259 (1911).

5. **S. rhizomata** Jepson. King's Checker. Stems succulent, green or purplish, erect or ascending, 1½ feet high, the decumbent or prostrate base rhizomatously rooting; herbage commonly glabrous or sparingly hirsute above; blades of basal leaves 1 to 4 inches broad, crenately but shallowly incised, long-petioled; blades of cauline leaves divided into 7 to 11 oblong-lanceolate or -oblanceolate divisions; stipules 4 to 8 lines long, broadly ovate, acuminate, or obtuse and toothed, green or purple; bracts scarious to membranous, hairy, deeply 2-lobed (the lobes ovate, acuminate), 4 to 6 lines long; flowers in spikes; spikes short, broad, dense, ½ to 1¼ inches long; calyx densely hairy, the hairs straw-color, long, simple; calyx-lobes ovate, acuminate, scarious and purple-tipped, 3 to 6 lines long; corolla light purple, ¾ to 1 inch long; carpels purple-tinged, strongly striate-grooved on the back and lightly reticulate on the sides, strongly incurved; beaks very slender, soon deciduous.

Marshes, 10 to 100 feet: Pt. Reyes Peninsula. May-July.

Tax. note.—The characters distinguishing Sidalcea rhizomata Jepson from S. calycosa Jones are mainly as follows: (a) stems rhizomatously rooting at decumbent bases; (b) herbage and stems more succulent; (c) transition abrupt from orbicular basal leaves to the pedately divided cauline leaves; (d) leaves, stipules and bracts larger; (e) inflorescence a dense thick spike; (f) hairs on calyx and bracts denser and coarser. The number of leaf divisions in S. calycosa is 6 to 8, in S. rhizomata 7 to 11, averaging more in the latter, usually 9 to 11. Delicate plants from the interior do, indeed, sometimes show the tendency toward rhizomatous rooting (*Tracy* 5645, Salt Springs Valley), but Sidalcea rhizomata stands out from S. calycosa as a definite departure, not as the extreme result of a gradual modification of the species S. calycosa as it approaches the coast.

Refs.—SIDALCEA RHIZOMATA Jepson, Man. 629 (1925), type loc. Russel ranch, Pt. Reyes Peninsula, Marin Co., *Jepson* 1174. *S. calycosa* Jepson, Fl. W. Mid. Cal. 240 (1901), in part, ed. 2, 259 (1911), in part; Roush, Ann. Mo. Bot. Gard. 18:145 (1931), in part; not S. calycosa Jones (1883).

6. **S. reptans** Greene. SIERRA CHECKER. Stems slender, usually simple, 9 to 24 inches high, ascending from decumbent bases which root at the nodes; rootstocks slender; herbage hirsute, the hairs mostly spreading, especially on the stems and petioles; leaves mainly basal or sub-basal, the blades orbicular, coarsely crenate to lobed or incised, or pedately divided, ¾ to 2½ inches wide; petioles of basal leaves 3 to 11 inches long; upper leaves few, the blades usually deeply 5 to 7-parted, short-petioled; inflorescence spicate, becoming 3 to 6 inches long, loose in age; pedicels 1 to 2 lines long; bracts oblong to linear, 1 to 3 lines long; flowers 6 to 9 lines long; petals emarginate, denticulate, deep pink, turning violet in age; carpels 8 to 10, favose-reticulate dorsally and laterally, pubescent, beaked.

Moist or wet meadows, 4000 to 7400 feet: Sierra Nevada from Amador Co. to Tulare Co.; San Bernardino Mts. July-Aug.

Locs.—Sierra Nevada: Antelope, Amador Co., *Hansen* 506; Confidence, Tuolumne Co., *Jepson* 7706; betw. Hog Ranch and Crocker sta., *Jepson* 4637; Mariposa Big Trees, *Bolander* 4998; Koontz Place, Mariposa Co., *Congdon;* Ellis Mdws., Madera Co., *K. Brandegee;* Grant Grove, Tulare Co., *T. Brandegee;* Round Mdw., Giant Forest, *Jepson* 675; Round Mt., Tulare Co., *Hopping* 177; Trout Mdw., Little Kern River, *Jepson* 4906. San Bernardino Mts.: Bluff Lake, *Munz* 10,572; Bear Valley, *Abrams* 2860.

Var. **ranunculacea** Jepson comb. n. Leaves more hairy; inflorescence capitate or interruptedly spicate, elongating after anthesis; flowers 4 lines long; carpels shallowly favose.—Wet meadows or stream banks, 6500 to 9000 feet: Tulare and Kern Cos.

Locs.—Garfield Forest, *Jepson* 4669; Hockett Mdw., *W. Fry* 427; Toowa Range, *Hall* 8362; Greenhorn Mts. (Ann. Mo. Bot. Gard. 18:167).

Var. **nana** Jepson var. n. Plants 2½ to 3¼ inches high, the leaves in a close basal tuft; spikes 1 or 2-flowered, the flowering stems nearly naked.—(Plantae unc. 2½–3¼ altae; folia basilaria, congesta; caules subscaposi; spicae 1 vel 2-florae.)—Dry ridges, 4000 to 6000 feet, Yollo Bolly Mts.: Soldiers Ridge, se. Trinity Co., *Jepson* 14,061 (type); Indian Dick ranger sta., se. Trinity Co., *Cronemiller* 589.

Refs.—SIDALCEA REPTANS Greene, Pitt. 3:159 (1897), type loc. Panther Creek, Amador Co., *Hansen* (typ. vidi). *S. spicata* var. *reptans* Jepson, Man. 630 (1925). *S. favosa* Congd. Erythea 7:183 (1900), type loc. Mariposa Co., *Congdon*. Var. RANUNCULACEA Jepson. *S. ranunculacea* Greene, Lflts. 1:75 (1904), type loc. Hocketts Mdw., Tulare Co., at 8600 feet, *Culbertson* 4318. *S. interrupta* Greene, l.c., type loc. "habitat of the last (S. ranunculacea) nearly but at a lower altitude, 8000 feet," *Culbertson* 4255. *S. spicata* var. *ranunculacea* Roush, Ann. Mo. Bot. Gard. 18:166 (1931). Var. NANA Jepson.

7. **S. asprella** Greene. PINE CHECKER. Stems several from slender running rootstocks, slender, ascending, leafy, 1 to 1½ feet high; herbage minutely and thinly hispidulose, or the stems glabrous or scurfy below; leaf-blades ¾ to 2 inches wide, cleft, parted or divided into (3 or) 5 or 7 linear, oblong or narrow-cuneate segments, these toothed, cleft or lobed; uppermost leaves with the blades 3 or 4-divided or sometimes simple; racemes lax, loose, few to several-flowered, 3 to 7 inches long; flowers 7 to 11 lines long; corolla pink; carpels reticulate dorsally, and lightly or obscurely so on sides.

Mountain slopes in open pine forest, often in red soil, 2500 to 7000 feet: Sierra Nevada from Fresno Co. to Shasta Co.; Humboldt Co. to Siskiyou Co. May-June.

Locs.—Sierra Nevada: Redding, *Heller* 7876; Grass Valley, Nevada Co., *Hall & Essig* 10,163; Ward Creek, Lake Tahoe, *L. S. Smith* 1658; Avery sta., Calaveras Co., *A. L. Grant;* Huntington Lake, *A. L. Grant* 1165. North Coast Ranges: Bridgeville, Humboldt Co., *Blankinship;* Horse Mt., Humboldt Co., *Tracy* 7659; upper Mad River, Trinity Co., *Blankinship;* Siskiyou Mts., *T. Brandegee.*

Var. **robusta** Jepson comb. n. Stems stout, erect, glabrous below; leaves beneath, inflorescence and calyces stellate-pubescent; flowers 1 to 1¼ inches long; calyx-lobes 3-nerved.—Butte Co.: Little Chico Cañon, *R. M. Austin* 822.

Refs.—SIDALCEA ASPRELLA Greene, Bull. Cal. Acad. 1:78 (1885), type loc. Eldorado Co., *Curran. S. malvaeflora* var. *asprella* Jepson, Man. 630 (1925). *S. elegans* Greene, Cyb. Columb. 1:35 (1914), type loc. Eight Dollar Mt., s. Ore., *Piper.* Var. ROBUSTA Jepson. *S. robusta* Hel.; Roush, Ann. Mo. Bot. Gard. 18:205 (1931), type loc. Chico Creek, near Chico, Butte Co., *Heller* 11,879.

8. **S. neomexicana** Gray var. **parviflora** Roush. Alkali Checker. Stems usually stout, 1½ to 4 feet high, arising from a branched root-crown; herbage nearly glabrous throughout, or (especially the leaves) sparsely hirsute or somewhat stellate-pubescent; leaf-blades crenately toothed, and 5 to 9-cleft, -parted or -divided, ¾ to 2 inches wide; petioles 2 to 6 inches long; racemes slender, 5 to 10 inches long or becoming so; bracts scarious, bifid, 1½ to 2 lines long, the divisions lanceolate; calyx slightly hirsute or sparsely stellate-pubescent; petals rose-color, erose at summit, 3 to 6 lines long; carpels glabrous, reticulated; beak small, recurved.

Brackish marshes or subalkaline plains, 100 to 5000 feet: Inyo Co. and south through the western Mohave Desert and its bordering mountains to the Los Angeles Co. and Orange Co. coasts. Apr.-June.

Locs.—Bishop, *Almeda Nordyke;* Haiwee Mdws., Inyo Co. (Cyb. Columb. 1:35); Fort Tejon, Kern Co., *Davy* 2366; Rabbit Sprs., Mohave Desert, *Parish* 9823; San Bernardino, *Parish;* Santa Monica; betw. Tustin and Myford, Orange Co., *Abrams* 3257a; betw. Santa Ana and Newport, *Alice King.*

Refs.—SIDALCEA NEOMEXICANA Gray, Mem. Am. Acad. 4:23 (1849), type loc. Santa Fe, N. Mex., *Fendler.* Var. PARVIFLORA Roush, Ann. Mo. Bot. Gard. 18:186 (1931). *S. parviflora* Greene, Erythea 1:148 (1893), type loc. Santa Monica, Los Angeles Co., *Hasse;* Jepson, Man. 631 (1925). *S. nitrophila* Parish, Erythea 7:93 (1899), type loc. Rabbit Sprs., Mohave Desert, *Parish* 1804. *S. covillei* Greene, Cyb. Columb. 1:35 (1914), type loc. Haiwee Mdws., Inyo Co., *Coville & Funston* 1004. *S. neomexicana* var. *covillei* Roush, Ann. Mo. Bot. Gard. 18:187 (1931).

9. **S. glaucescens** Greene. Bird Checker. Stems slender, lax, procumbent to erect, 1 to 2 feet high, arising from a woody and very hard and heavy root-crown; herbage glaucous and glabrous, or minutely stellate-puberulent; leaf-blades palmately cleft or divided, ¾ to 2 inches wide, the divisions mostly linear or oblong, entire or few-toothed, the uppermost leaf-blades rarely simple and lanceolate; racemes 2 to 6 inches long, extremely lax, the flowers at intervals of ½ to 1 inch; pedicels and calyx somewhat stellate-puberulent; bracts bifid; corolla purple, 4 to 10 lines long; carpels large, inflated, lightly reticulate and dorsally grooved, the beaks minute or obsolete.

Grassy flats or open forest, 5500 to 11,000 feet: Siskiyou Co.; Sierra Nevada from Modoc Co. to Tulare Co. June-Sept.

Locs.—Log Lake, Siskiyou Co., *Butler* 61; Mt. Bidwell, Warner Mts., *Jepson* 7864; Mineral, Tehama Co., *J. Grinnell;* Jonesville, Butte Co., *Heller* 11,656; betw. Truckee and Lake Tahoe, *Sonne* 42; Summit sta., Nevada Co., *Jepson* 14,066; Cisco, Placer Co., *H. A. Walker;* Dorrington, Calaveras Co., *Jepson* 10,055; Calaveras Big Trees, *Greene;* Williams ranch, near Confidence, Tuolumne Co., *Blasdale;* Hog ranch, Tuolumne Co., *Jepson* 4637a; Crane Creek, Mariposa Co., *Jepson* 4645; Lion Mdw., Little Kern River, *Jepson* 1038.

Refs.—SIDALCEA GLAUCESCENS Greene, Bull. Cal. Acad. 1:77 (1885), type loc. Donner Lake, *Curran;* Jepson, Man. 631 (1925). *S. montana* Congd. Erythea 7:183 (1900), type loc. e. of Minarets, Mariposa Co., *Congdon.*

10. **S. pedata** Gray. Mountain Sidalcea. Stems subscapose, several from the root-crown, erect, 6 to 12 inches high; herbage hirsute with spreading hairs, or the stems above glabrate; inflorescence finely stellate-pubescent; leaves many,

mainly basal, the blades 1 to 1¾ inches wide, pedately parted into 5 to 7 divisions, the cuneate divisions 2 to 3-lobed or -divided; petioles 2 to 4 (or 6) inches long; stipules and bracts purplish; spikes at first dense, 1 to 1½ inches long, elongating after anthesis; corolla rose-purple, 5 lines long; petals narrow, erose, 2-toothed at apex; filaments nearly distinct, those of the outer series slightly united into sets; carpels rounded, smooth, 1½ to 1¾ lines long.

Moist meadows, 6000 to 7400 feet: San Bernardino Mts. June-July.

Locs.—Bluff Lake, *Munz* 10,600; Metcalf Mdws., Bear Valley, *Parish* 10,876.

Refs.—SIDALCEA PEDATA Gray, Proc. Am. Acad. 22:288 (1887), type loc. Bear Valley, San Bernardino Mts., *Parish*. *S. spicata* var. *pedata* Jepson, Man. 630 (1925).

11. **S. eximia** Greene. PRAIRIE CHECKER. Stems stout, erect or decumbent at base, paniculately branched above, 2 to 3 feet high; herbage, especially the stems, markedly hirsute; blades of lower leaves palmately cleft or divided (the divisions 3-lobed), 3 to 5 inches wide, on petioles 7 to 19 inches long; blades of upper leaves divided into 5 to 9 linear or oblong segments 2½ to 3 inches long, shortly petioled; spikes very dense, ¾ to 2¾ inches long; flowers 5 to 6 lines long on short hairy pedicels; bracts linear, or deeply notched, purple-tinged, hairy, 2 to 4 lines long; calyx conspicuously hairy, in fruit papery, 5 to 6 lines long, the lobes triangular-acuminate, 3 to 4 lines long; corolla pink; fruiting spikes with densely imbricated calyces; carpels smooth, 1 to 2 lines long, slenderly beaked; seeds blackish.

Wet meadows, 50 to 3500 feet: northern Humboldt Co. June-July.

Locs.—Dows Prairie, *Jepson* 9324; Elk Prairie, *Tracy* 2578; Murphy Mdw., Bald Mt., *Tracy* 4831.

Refs.—SIDALCEA EXIMIA Greene, Cyb. Columb. 1:34 (1914), type loc. Elk River, Humboldt Co., *Tracy;* Jepson, Man. 629 (1925). *S. spicata* Roush, Ann. Mo. Bot. Gard. 18:159 (1931), in part.

12. **S. oregana** Gray. OREGON CHECKER. Stems few from a woody root-crown, nearly naked above, usually paniculately branched, 1 to 5 feet high; herbage and inflorescence finely stellate-pubescent or the lower parts glabrous; blades of lower leaves orbicular, shallowly toothed or cleft (rarely deeply parted), 1 to 4 inches wide; blades of cauline leaves incisely parted with the lobes toothed or cleft, or the blades of the uppermost pedately divided into 5 to 7 lanceolate, linear or 3-lobed divisions; petioles 2 to 7 inches long; spikes several, 1 to 4 inches long or much elongated in fruit, long-peduncled; bracts narrowly linear or subulate; corolla rose-pink, in the staminate 5 to 8 lines long, in the pistillate 3 to 4 lines long; carpels semi-orbicular, slightly beaked, glabrous and smooth or shallowly reticulate dorsally, 1 line long.

Moist meadows or stream banks, 2600 to 6000 feet: Siskiyou Co., and south perhaps to Napa Co.; Modoc Co. North to Washington, east to Wyoming and Utah. May-Aug.

Note on variation.—The pubescence and racemes are especially variable. There is exhibited: stellate pubescence throughout; stellate pubescence only on the inflorescence and calyx; hirsute bristles on the herbage; herbage more or less glabrous; spikes short or elongated: these factors in various combinations give expression to the group here known as Sidalcea oregana and its varieties and forms and intermediates. The herbage, inflorescence and calyx may be (a) stellate-pubescent throughout (typical S. oregana), or (b) the stems and petioles may be glabrous (or with only a few hairs below) and the inflorescence stellate-pubescent (intergrade towards var. spicata: Sisson, *Jepson* 5784), or (c) the herbage may be bristly-pubescent with stellate-pubescent inflorescence and calyces, or again (d) the herbage may be bristly-pubescent with stellate-pubescent inflorescence and stellate-pubescent and hirsute calyces (var. spicata). There are intergrades amongst these various phases. Spikes capitate or elongated have no geographic significance and do not seem to be a criterion otherwise.

Locs.—Siskiyou Co.: Mt. Shasta (vicinity of), *Palmer* 2532; Oro Fino, *Butler* 63; Yreka, *Butler* 768. Modoc Co.: Alturas, *Taylor & Bryant;* Warner Mts., *Manning* 45; Goose Lake, *R. M. Austin*. The following apparently belong here also: Howell Mt., Napa Co., *Jepson* 14,062; Soldiers Ridge, se. Trinity Co., *Jepson* 14,072.

Var. **spicata** Jepson comb. n. Stems several from the root-crown, slender, erect, often paniculately branched above, 1 to 4½ feet high; herbage with scattered somewhat bristly hairs, those of the stems and petioles spreading; leaf-blades crenately lobed or incised or parted, 1 to 3½ (or 5) inches wide; blades of upper leaves pedately parted; spikes loose to dense, 1 to 4 inches long; inflorescence finely stellate-pubescent; flowers 4 to 7 lines long; calyx finely stellate-pubescent and hirsute, or sometimes not hirsute; petals narrow, notched at apex, 4 to 8 lines long; carpels small, 1 line long, more or less tomentose, not reticulate, slightly beaked, the beak hairy.—Wet soil of meadow or streamlet borders and of cañon bottoms: Sonoma Co. to western Siskiyou Co., 400 to 4000 feet; Sierra Nevada from eastern Siskiyou Co. to Tuolumne Co., 4000 to 8000 feet. June-Sept.

Locs.—North Coast Ranges: Kenwood, Sonoma Co., *M. S. Baker* 3203c; Lee Logan ranger sta., O'Neil Ridge, ne. Mendocino Co., *Cronemiller* 796; Sisson, *Jepson* 5784; Oro Fino, Siskiyou Co., *Butler* 62. Sierra Nevada: Goosenest Mt., e. Siskiyou Co., *Butler* 905; Lassen Peak trail, *J. Grinnell;* Bear Valley, Nevada Co., *Jepson* 14,065; Hot Sprs., Tahoe, *Sonne* 342; Kennedy Lake, Tuolumne Co., *A. L. Grant* 191. Nevada: Brockway, w. Washoe Co., *Jepson* 7751. The following are similar, save that the stellate-pubescent calyces are not hirsute: Modoc Co., *L. S. Smith* 1031; Mineral, Tehama Co., *J. Grinnell;* Eagle Lake, *Brown & Wieslander* 65; Dog Valley, e. Nevada Co., *Jepson* 14,063.

Refs.—SIDALCEA OREGANA Gray, Mem. Am. Acad. 4:20 (1849); Jepson, Fl. W. Mid. Cal. 240 (1901), ed. 2, 260 (1911), Man. 630 (1925). *Sida oregana* Nutt.; T. & G. Fl. 1:234 (1838), type from "west side of the Rocky Mts.", *Nuttall.* *S. malvaeflora* var. *oregana* Wats.; Macoun, Cat. Can. Pl. 3:501 (1886), as to synonymy only, acc. Roush, Ann. Mo. Bot. Gard. 18:168 (1931). Var. SPICATA Jepson. *S. spicata* Greene, Bull. Cal. Acad. 1:76 (1885), type loc. Cisco, Sierra Nevada, *Kellogg;* Jepson, Man. 629 (1925). *Callirhoe spicata* Regel, Gartenfl. 21:291, pl. 737 (1872), "in der Sierra Nevada, Californiens". *Sidalcea murrayana* Gray, Syn. Fl. 1^1:306 (1897), a garden name. *S. valida* Greene, Pitt. 3:157 (1897), type loc. Knights Valley, Sonoma Co., *Greene* (plants stout, inflorescence paniculate). *S. hydrophila* Hel. Muhl. 1:107 (1904), type loc. near Hullville, ridge betw. Eel River and Rice Creek, Lake Co., *Heller* 6047.

13. **S. malvaeflora** Gray. HILL CHECKER. Stems several from a woody root-crown, simple or branched, erect or half decumbent at base, 1¼ to 2 feet high, retrorsely hispid below with scattered hairs, usually stellate-pubescent above; blades of lower leaves ½ to 1½ (or 3) inches wide, crenate or crenately incised or cleft into cuneate-obovate 2 to 4-toothed lobes, their petioles 1 to 8½ inches long; blades of upper leaves palmately twice cleft into linear or narrowly oblong divisions; racemes rather loose, 3 to 12 inches long; bracts ovate, herbaceous, often notched at apex or decidedly bifid; flowers of two sorts: one perfect with large corollas, the other pistillate with small corollas; corolla of perfect flowers ½ to 1¼ inches long, the outer series of filaments united for about half their length into sets of 4 and 2, the inner filaments mostly distinct; corolla of pistillate flowers 4 to 7 lines long, the filaments destitute of good anthers; carpels subglabrous, more or less rugulose-reticulate, 1¾ lines long, beaked, or the beaks often obsolete.

Open grassy hillslopes and cañon sides, 10 to 3000 (or 7000) feet: Shasta Co. foothills; Humboldt Co. to Marin Co. and east to western Solano Co.; South Coast Ranges; Tehachapi Mts.; cismontane Southern California. South to Lower California, north to southern Oregon. Feb.-May.

Historical note.—The first collector of Sidalcea malvaeflora was Jose Mariano Mociño, without reasonable doubt at Monterey. He accompanied Quadra to Nootka, Vancouver Island, from Mexico in 1792. In September, 1792, Archibald Menzies in his Pacific Coast Journal (p. 254. ms. Jepson Library) speaks of seeing Mociño and his draughtsman Echeverria at Nootka and says that they were to follow Don Quadra to California. On January 1, 1793, Menzies writes a letter to his friend Sir Joseph Banks of London from Monterey, California, and remarks that the two botanists are here who have been with Don Quadra to the northward all summer (Letters from Archibald Menzies to Sir Joseph Banks, p. 28. ms. Jepson Library). The first illustration of Sidalcea malvaeflora was made by Echeverria as a part of the Mociño and Sesse collection of drawings. Later, with the whole of the Mociño and Sesse drawings, it was duplicated for publication in DeCandolle's "Calques des dessins de la flore du Mexique de Mociño et Sesse", t. 70 (1874). A copy of this rarity, the "Calques", is in the University of California Library.

Locs.—Coast Ranges: Yager Creek (head of), Humboldt Co., *M. S. Baker* 38; Hydesville, Humboldt Co., *Tracy* 3595; Ukiah, *Purdy;* Araquipa Hills, w. Solano Co., *Jepson* 14,077; Vineland, Napa Valley, *Jepson* 14,076; Sonoma Valley, *Jepson* 9191, 9192; Olema, Marin Co., *Jepson* 8290; Ross Valley, Marin Co., *Jepson* 14,060; Berkeley Hills, *Jepson;* Walnut Creek, *Brewer*

1002; Newark, Alameda Co., *Davy* 1101; Hunter Pt., San Francisco, *Jepson* 12,706; Little Arthur Creek, w. of Gilroy, *Jepson* 9708; Corallitos, Santa Cruz Co., *Jepson* 14,059; Carmel, *E. Ferguson* 295; Morro, San Luis Obispo Co., *Barber;* Arroyo Grande, *Alice King;* Cuyama, *Eastwood.* Tehachapi Mts.: Tehachapi, *T. Brandegee.* Southern California: Mt. Pinos, Ventura Co., *Hall* 6503; Pt. Salinas, Santa Barbara Co., *Ida Blochman;* Sulphur Mt., Ventura Co., *Epling & Anderson;* Ojai Valley, *Hubby;* Santa Monica, *Barber;* San Dimas, *Chandler;* San Bernardino Valley, *Parish* 6957; Hemet Valley, *Munz* 5441; Cootca, Palomar Mt., *Jepson* 1545; Escondido, *Alice King;* Mesa Grande, San Diego Co., *E. Ferguson;* Cuyamaca Lake, *Munz* 9777; La Jolla, *Jepson* 11,877. In more exposed situations, the upper divided leaves are mostly absent: Mendocino City; betw. Sea View and Stewarts Pt., Sonoma Co., *M. S. Baker;* Bodega Bay, *Chandler* 713; Baldy Peak, Berkeley, *Chandler* 214; Lake Merced, San Francisco, *K. Brandegee.*

Var. **celata** Jepson var. n. Herbage stellate-hispid, the stems sparsely so or subglabrous; leaves mostly basal, blades of the basal cleft or parted into broad lobes, blades of the upper deeply parted or divided, often into narrow lobes; inflorescence usually elongated; flowers on pedicels ½ to 4 lines long or subsessile; bracts bifid, the segments linear or lanceolate.—(Herbae stellati-hispidae, aliquando caulibus glabratis; folia plerumque basilaria, in lobos latos incisa; folia caulina pauca, profunde partita, saepe lobis angustis; inflorescentia plerumque elongata; bracteae bifidae, segmentis linearibus vel lanceolatis.)—Upper Sacramento Valley in Shasta Co.: Olinda, *Blankinship* (type); Anderson, *Alice King.*

Var. **californica** Jepson. Stems stout, erect; herbage densely stellate-pubescent; calyx-lobes 3 to 5-nerved; carpels hispidulose.—Valleys and hillsides, 50 to 1000 feet: Santa Barbara (*Geo. B. Grant* 5452) to Ventura Co. (Ojai Valley, acc. Ann. Mo. Bot. Gard. 18:200).

Refs.—SIDALCEA MALVAEFLORA Gray; Benth. Pl. Hartw. 300 (1848); Jepson, Fl. W. Mid. Cal. 240 (1901), ed. 2, 260 (1911), Man. 630, fig. 627 (1925). *Sida malvaeflora* DC. Prod. 1:474 (1824), type recorded as from "Mexico", undoubtedly from Monterey, Cal., *Mociño. Nuttallia malvaeflora* F. & T.; F. & M. Ind. Sem. Hort. Petrop. 3:41 (1837). *Sidalcea humilis* Gray, Mem. Am. Acad. 4:20 (1849). *Sida delphinifolia* Nutt.; T. & G. Fl. 1:235 (1838), type loc. Santa Barbara, *Nuttall. Sidalcea delphinifolia* Greene, Fl. Fr. 105 (1891); not S. delphinifolia Gray (1848). *S. scabra* Greene, Pitt. 3:158 (1897), type loc. Byron Hot Sprs., e. Contra Costa Co., *Greene. S. rostrata* Eastw. Bull. Torr. Club 29:80 (1902), type loc. Mendocino, *H. E. Brown* 815. Var. CELATA Jepson. Var. CALIFORNICA Jepson, Man. 630 (1925). *Sida californica* Nutt.; T. & G. Fl. 1:233 (1838), type loc. Santa Barbara, *Nuttall. Sidalcea californica* Gray, Mem. Am. Acad. 4:19 (1849).

14. **S. malachroides** Gray. Coast Checker. Stems several from the base, stout, 2 to 4 feet high, equably leafy to the summit, simple below, ending above in a panicle of spikes; herbage stellate-hispidulous to -hirsute; leaves vitiform, the blades palmately but shallowly lobed, unequally dentate, 1 to 6 (mostly 2 to 3) inches broad; spikes oblong, very dense, ½ to 2½ inches long; bracts linear or subulate, 2 to 3 lines long; calyx-lobes ovate, acuminate; petals white, broad, notched, abruptly clawed; staminate flowers 5 to 6 lines long, the filaments of the outer series united for about ½ their length or less into pairs, or two such pairs slightly united by their bases making a set of 4; carpels sometimes present; pistillate flowers 3 to 4 lines long, the tube of filaments short, more or less truncate and without anthers; carpels 7 to 9, half dehiscent by a ventral suture, 1 to 2 lines long.

Along the coast, 5 to 200 feet: Humboldt Co. to Monterey Co., mostly at scattered stations. May-June.

Note on variation.—The pubescence of Sidalcea malachroides varies from rather densely long-hirsute to rather sparsely and shortly stellate-pubescent. The leaf-blades are more or less deeply angular-lobed or sometimes merely crenate-lobed. In response to cultivation they increase remarkably in size, becoming 9 inches wide. The petals in specimens from Monterey Co. tend to be broadly spatulate-obcordate with a very wide notch, while those of the more northerly portion of the range are usually oblong-obcordate with a rather narrow notch.

Locs.—Betw. Korbel and Angels ranch, n. Humboldt Co., *Jepson* 1929; Engelwood Prairie, Humboldt Co., *Davy* 5482; Arcata, *Chesnut & Drew;* Eureka, *Tracy* 3010; Holmes Flat, lower Eel River, *Tracy* 4964; Westport, Mendocino Co., *K. Brandegee;* Inglenook, Mendocino Co., *Congdon;* Point Arena, *Michener & Bioletti;* Mill Creek, near Sur River, Santa Lucia Mts., *Davy* 7301.

Refs.—SIDALCEA MALACHROIDES Gray, Proc. Am. Acad. 7:332 (1868); Jepson, Fl. W. Mid. Cal. 241 (1901), ed. 2, 260 (1911), Man. 631 (1925). *Malva malachroides* H. & A. Bot. Beech. 326 (1838), type from Cal., *Douglas. Hesperalcea malachroides* Greene, Pitt. 2:301 (1892). *S. vitifolia* Gray, Proc. Am. Acad. 7:332 (1868), type loc. Bear Harbor, Mendocino Co., *Bolander* (acc. Roush, Ann. Mo. Bot. Gard. 18:217, the type number of S. vitifolia, 6473, differs from the typical form of species, S. malachroides, only in the more angulately lobed leaves and in the shorter and harsher pubescence).

15. **S. hickmanii** Greene. CHAPARRAL CHECKER. Stems several, erect, 2 to 3 feet high, leafy throughout; herbage, inflorescence and calyces stellate-pubescent or stellate-hirsute; leaf-blades serrate or shallowly incised, 1¼ to 2 inches wide, the lowest leaves smaller than the middle ones; petioles 2 to 9 lines long, often shorter than the blades; racemes many, spicate, 3 to 7 inches long, the pedicels 1 line long; bracts narrowly linear, villous; calyx submembranous, 3 to 6 lines long, bearing 3 linear bractlets 2½ to 3 lines long; corolla rose-purple, 7 to 8 lines long; stamens not conspicuously 2-ranked, the outer series united only at base into 3 or 4 sets; carpels mostly smooth.

Chaparral slopes, especially on clearings or burns, 500 to 2500 feet: Marin Co.; Monterey and San Benito Cos. June.

Locs.—Big Carson Ridge, Marin Co. (Ann. Mo. Bot. Gard. 18:213); Reliz Cañon, Monterey Co.

Var. **parishii** Rob. Stems 1 to 1½ feet high; pubescence short, stellate or stellate-hirsute; leaf-blades ½ to 1 inch wide; spikes shorter, the rachis 1 to 4 inches long; bracts stipular, ovate-acuminate to lanceolate, 3 to 5 lines long; bracteoles similar or usually narrower, lanceolate to linear, 2½ to 3 lines long; corolla 4 lines long.—Dry soil, clearings or burns, 4600 to 7000 feet, San Bernardino Mts.: Seven Oaks, *Parish* 3786; Foxesee Creek, *Munz* 6339; Yucaipa Mts., *F. M. Reed* 2755. June-July.

Refs.—SIDALCEA HICKMANII Greene, Pitt. 1:139 (1887), type loc. Reliz Cañon, Salinas Valley, *Hickman;* Jepson, Man. 631 (1925). Var. PARISHII Rob.; Gray, Syn. Fl. 1¹:307 (1897), type loc. Seven Oaks, San Bernardino Mts., *Parish* 3786; Jepson, Man. 631 (1925). *Malvastrum confertum* Parish; Jepson, l.c. as synonym. *S. parishii* Dav. & Mox. (by error "Rob."), Fl. S. Cal. 231 (1923).

5. **SIDA** L.

Ours low whitish scurfy-tomentose perennial herbs. Pedicels articulated. Involucel of 1 to 3 slender deciduous bractlets. Flowers in ours cream-white. Carpels 1-seeded, indehiscent or splitting into 2 valves. Seeds pendulous.—Species 130, all continents, mostly tropical. (Greek name used by Theophrastus for a species of Water-lily.)

1. **S. hederacea** Torr. ALKALI MALLOW. Stems decumbent, more or less branching, ½ to 1 foot long; leaf-blades round-reniform or ovate, dentate or serrate, ¾ to 2 inches broad, on petioles ½ to 1 inch long; flowers pediceled, axillary, solitary or in small clusters; petals ½ inch long; carpels 6 to 10, triangular, attached by a straight edge to the slender axis.

Saline or subsaline soils, 5 to 4000 (or 6000) feet: interior valleys (both cismontane and transmontane) throughout California and toward the coast southward. North to Washington, east to Texas, south to Mexico. May-Sept.

Geog. note.—On the open plains and low foothills where the soil is more or less alkaline, Sida hederacea is, in the dry season, one of the most common and widespread species of the interior valleys. On account of its deep-seated roots it is often a pest in orchards where cultivation multiplies it, although it is not shade-tolerant. In such places it is known as White-weed. On flood-plain valley floors its taproots usually descend to the water table. It is a honey bee plant of importance to apiarists. In the Imperial Valley it is called Sniffle Weed, with Snuffle Weed as a variant.

Locs.—Cismontane Cal.: Princeton, Colusa Co., *Davy* 4303; Vacaville, *Jepson* 14,048; Suisun Marshes, *Jepson* 10,235; Ione, Amador Co., *Braunton* 1186; Stockton, *Davy* 826; Stevinson (w. of), Merced Co., *Jepson* 12,941; Pacheco Pass, *Brewer* 1293; Lorenzo Creek, San Benito Co., *Bettys;* San Miguel, San Luis Obispo Co., *K. Brandegee;* Fresno, *Brewer* 2779; Bakersfield, *Davy* 1849; San Bernardino, *Parish;* Buena Park, Orange Co., *Hamlin;* Escondido, *Chandler* 5396; National City, *Cleveland.* Transmontane Cal.: Honey Lake Valley, *Davy* 3330; Bridgeport, Mono Co., *Bolander* 6264; Palo Verde Valley, *Schellenger* 113; Rockwood, Colorado Desert, *Parish* 8316.

Refs.—SIDA HEDERACEA Torr.; Gray, Mem. Am. Acad. 4:23 (1849); Jepson, Fl. W. Mid. Cal. 243 (1901), ed. 2, 261 (1911), Man. 631, fig. 628 (1925). *Malva hederacea* Dougl.; Hook. Fl. Bor. Am. 1:107 (1830), type loc. "interior districts of the Columbia" River (Fort Walla Walla, Contrib. U. S. Nat. Herb. 11:390), *Douglas. M. californica* Presl, Rel. Haenk. 2:121 (1831), type loc. Monterey, *Haenke. M. plicata* Nutt.; T. & G. Fl. 1:227 (1838), type loc. Walla Walla River,

e. Ore.-Wash. boundary, *Nuttall.* *S. obliqua* Nutt.; T. & G. Fl. 1:233 (1838), type loc. Walla Walla River, e. Ore.-Wash. boundary, *Nuttall.* *Disella hederacea* Greene, Lflts. 1:208 (1906).

6. **MODIOLA** Moench

Low perennial herb. Leaves with the blades rounded, coarsely crenate, palmately lobed or incised. Flowers small, solitary on axillary peduncles, subtended by 2 or 3 narrow bractlets. Corolla dull red. Fruit a somewhat depressed circle of 15 to 30 carpels with 2 seeds in each. Carpels reniform, septate between the seeds, tardily 2-valved from the top, at length deciduous from the axis.—Species 1. (Latin modiolus, relating to the wheel-like fruit.)

1. **M. caroliniana** G. Don. Stems spreading, 6 to 18 inches long; leaf-blades 1 to 1½ inches broad; petals 2 to 3 lines long; carpels hirsutulose.

Introduced plant, sparingly naturalized in California. Virginia to Texas and south to Argentina; South Africa. Sept.

Locs.—Ferndale, Humboldt Co., *Davy* 6176; Auburn (Fl. Fr. 107); Berkeley, *Jepson* 10,750; Los Banos, Merced Co., *E. M. Johnston;* Swift ranch, Madera Co., *Kennedy;* Los Angeles (Erythea 1:58); Riverside, *F. M. Reed* 3679.

Refs.—MODIOLA CAROLINIANA G. Don, Gen. Hist. Pl. 1:466 (1831); Jepson, Man. 632 (1925). *Malva caroliniana* L. Sp. Pl. 688 (1753), type from the Carolinas. *Modiola multifida* Moench, Meth. 620 (1794). *M. decumbens* G. Don, l.c.

7. **SPHAERALCEA** St. Hil. GLOBE MALLOW

Herbs or shrubs, ours mostly hoary-tomentose or canescent, with commonly roundish or angular leaf-blades. Flowers commonly in racemes, the racemes often subpaniculate, sometimes corymbose, or often reduced to axillary fascicles. Corolla rose or pink to red or white. Bractlets present (in ours), slender or filiform. Carpels 5 or more, each 1 to 3-seeded, in fruit often dehiscent and 2-valved. Seeds (at least the lower) ascending.—Species about 240, North and South America, Africa. (Greek sphaera, a sphere, and alkea, mallow, the carpels commonly spherical.)

Tax. note.—In this treatment Sphaeralcea receives Malvastrum (as to North American plants, which include the type of the genus). The maintenance of Malvastrum as a separate genus is difficult to justify upon available data. It would appear, however, that the two are somewhat more clearly differentiated in certain areas of the Old World than in western North America. According to Phillips (Genera of the South African Flowering Plants, 402, 403) the petals of Malvastrum are always yellow, while in Sphaeralcea they vary from white to purple. No such distinction holds for American plants. In western America the distinctions are as follows: In Sphaeralcea the placenta is smaller and the carpels usually 2 or 3-ovuled. Sometimes however, they are apparently only 1-ovuled, or more often the seed is solitary by abortion of the upper ovule. Thus in 1-seeded carpels the upper portion is empty and often more or less reduced, although sufficient to give a rounded appearance to the capsule. The lower portion of the carpel sides is characteristically reticulated. In certain species or varieties, however, this reticulation is obscure or obsolete. In Malvastrum the placenta is broader, the carpels 1-ovuled with the ovule ascending and the centrally located seed nearly or quite completely filling the carpel. The fruit is thus definitely flattened. These differences appear too slight to serve as the basis for generic segregation.

A. Carpels one-ovuled, one-seeded.—Subgenus MALVASTRUM.

Annuals; leaf-blades orbicular.
  Petals rose-purple with crimson blotch at base; leaves merely crenate..........1. *S. rotundifolia.*
  Petals white or violet-purple, without blotch; leaves 5 to 7-lobed.
    Flowers 2½ to 4 lines long; herbage stellate-pubescent..........2. *S. exilis.*
    Flowers 6 to 12 lines long; herbage hirsute..........3. *S. parryi.*
Perennials.
  Flowers in terminal heads; calyx densely hirsute; Monterey and San Luis Obispo Cos..........4. *S. palmeri.*
  Flowers in axillary glomerules, the glomerules remotely spicate or in subpaniculate racemes; calyx stellate-pubescent or -hirsute.

Calyx with long stellate-hirsute hairs; heads several along the naked summit of branches; San Jacinto Mts. to eastern San Diego Co....................................5. *S. densiflora.*

Calyx stellate-pubescent.

Bractlets ovate; s. Monterey Co..6. *S. aboriginum.*

Bractlets lanceolate to linear.

Herbage covered with a dense white tomentum.

Flower-buds merely tomentulose, the calyx-lobes not concealed.

Leaf-blades round-cordate or pentagonal; corolla rose-color, sometimes aging yellow.

Panicle with the glomerules sessile or subsessile, thus interrupted-spicate, not leafy; leaf-blades relatively thin, not markedly rugose; mts. bordering west half Mohave Desert.... 7. *S. orbiculata.*

Panicle with mostly racemose-peduncled branches, leafy throughout or the leaves reduced at summit; leaf-blades thick, rugose; cismontane S. Cal........................8. *S. davidsonii.*

Leaf-blades ovate, conspicuously rugose; corolla yellow; Santa Clara and Santa Cruz Cos..9. *S. arcuata.*

Flower-buds heavily invested in a dense wool, the calyx-lobes concealed; corolla rose-pink; leaf-blades pentagonal or roundish, cordate at base, the lobes roundish; Great Valley foothills....10. *S. fremontii.*

Herbage finely stellate-pubescent; South Coast Ranges; S. Cal.......................... 11. *S. fasciculata.*

B. Carpels 2-ovuled, one to 3-seeded; ours perennial.—Subgenus EUSPHAERALCEA.

Mature carpels one-seeded; upper empty portion of carpels minute and inconspicuous; plants leafy; racemes from upper axils; corolla small, vermilion; Colorado Desert...................... 12. *S. orcuttii.*

Mature carpels one to 3-seeded; upper portion of carpels not conspicuously reduced.

Carpels glabrous or merely canescent on back, more or less reticulate on lower portion of sides.

Leaf-blades palmately parted or divided with cleft or toothed lobes; Panamint Range.... 13. *S. eremicola.*

Leaf-blades crenate or shallowly lobed.

Leaf-blades mostly lanceolate or oblong to linear; deserts chiefly.

Flowers few in the leaf axils; leaves thickish, rugose..............14. *S. angustifolia.*

Flowers numerous in an elongated panicle; leaves thin, not rugose...................... 15. *S. fendleri.*

Leaf-blades broader, cordate to orbicular-ovate; flowers numerous in elongated thyrsoid panicles.

Flowers apricot-color to salmon-red; leaves thickish; deserts....16. *S. ambigua.*

Flowers pink, drying violet-purple; leaves thinnish; mts. on west side of Colorado Desert..17. *S. rosacea.*

Carpels covered on back with long bristles, thus forming a somewhat bur-like fruit; flowers large, sparse; corolla rose-color.

Calyx-lobes ovate, acute or acuminate; leaf-blades deeply 5-lobed, truncate or subcordate at base, 2½ to 6 inches long; Humboldt Co....................................18. *S. rivularis.*

Calyx-lobes round-ovate, abruptly acute; leaf-blades typically cuneate-obovate, ¾ to 1 inch long; Shasta and Modoc Cos...19. *S. bakeri.*

1. **S. rotundifolia** Jepson. FIVE-SPOT MALLOW. Stem erect, branching, 4 to 16 (or 24) inches high; herbage hirsute; leaves few, the blades orbicular-cordate, crenate, ½ to 2 inches wide, the petioles 1 to 3 inches long; bractlets filiform; flowers in terminal corymbs or corymbose racemes; petals rose-pink with a large red-purple spot below middle of petal, 9 to 13 lines long; carpels 35 to 45, very flat, narrow on the back, black, rugose-reticulate.

Washes, lava plains and sandy-gravelly slopes or mesas, –280 to 3800 feet: Inyo Co.; eastern Mohave Desert; Colorado Desert. East to Arizona. Apr.-May.

Field note.—A frequent annual, everywhere in the deserts, in years of rainfall, though never closely colonizing any considerable areas. The aestivation of the lilac or pink-crimson petals in anthesis is such as to form a globose corolla, the circular crimson or maroon spot at the base of each petal large and showy.

Locs.—Inyo Co.: Shoshone, *R. S. Ferris* 8004; Argus Mts., *Purpus* 5316; Bad Water, Death Valley, *J. Grinnell;* Furnace Creek, Funeral Mts., *Jepson* 6922. Mohave Desert: Needles, *Jepson* 5479; Newberry, *Newlon* 505; Yermo, *Jepson* 15,861; Ord Mt., *Jepson* 15,498; Barstow, *Jepson*

5821. Colorado Desert: Corn Sprs., Chuckwalla Mts., *Munz & Keck* 4874; Painted Cañon, Mecca Hills, *Jepson* 11,680, Coachella, *Hall* 5793; Coyote Creek near Coyote Mt., ne. San Diego Co., *Jepson* 8871; Borrego Valley, *Jepson* 8867; Fort Yuma, *Jepson.*

Refs.—SPHAERALCEA ROTUNDIFOLIA Jepson, Man. 633 (1925). *Malvastrum rotundifolium* Gray, Proc. Am. Acad. 7:333 (1867), type loc. Ft. Mohave, Ariz., *Cooper. Eremalche rotundifolia* Greene, Lflts. 1:208 (1906).

2. **S. exilis** Jepson. GROUND MALLOW. Stems several from the base, diffuse or decumbent, 4 to 18 inches long; herbage stellate-pubescent; leaf-blades palmately 3 to 5-cleft with dentate or incisely-toothed lobes. 3 to 5 (or 11) lines wide; bractlets 3, slender; calyx-lobes ovate, acuminate; petals white or rose-color, obovate, 2½ to 4 lines long; anthers blue; carpels subreniform, transversely rugose.

Sandy plains and washes and desert mesas, 150 to 2800 feet: inner South Coast Range; a weed immigrant in the San Joaquin Valley; Mohave and Colorado deserts. South to Lower California. Mar.-May.

Field note.—In late winter when this plant first appears on the sandy mesas and flats in the desert, its earliest leafage is curiously suggestive of that of a buttercup. The 12 to 15 stamens are about ⅔ the length of the corolla which is 2½ lines wide. The calyx-lobes usually equal the corolla.

Locs.—Inner South Coast Range: Elkhorn Scarp, se. San Luis Obispo Co., *Jepson* 16,226. San Joaquin Valley: Merced, *Bolander* 4843; Huron, Fresno Co., *Eastwood;* McKittrick, *Jepson* 16,242; Bakersfield, *Jepson* 6764. Mohave Desert: Lancaster, *Davy* 2282; Mohave sta., *Jepson* 15,443; Kramer, *Jepson* 5330; Calico Wash, n. of Daggett, *Jepson* 6704. Colorado Desert: McCoy Wash, e. Riverside Co., *Hall* 5928; Whitewater, *Jepson* 11,629; Palm Sprs. of San Jacinto, *Parish* 99; Borrego Sprs., *T. Brandegee;* Vallecito, e. San Diego Co., *Jepson* 8597.

Refs.—SPHAERALCEA EXILIS Jepson, Man. 633 (1925). *Malvastrum exile* Gray, Ives Rep. 8 (1860), type loc. Pyramid Cañon, Colorado Desert, *Newberry;* Jepson, Fl. W. Mid. Cal. 242 (1901), ed. 2, 261 (1911) in part. *Malveopsis exilis* Ktze. Rev. Gen. Pl. 1:72 (1891). *Eremalche exilis* Greene, Lflts. 1:208 (1906).

3. **S. parryi** Jepson. VIOLET MALLOW. Stem erectly branching from or near the base, 10 to 19 inches high; herbage thinly puberulent or the stems subglabrous; leaf-blades twice lobed or cleft, ¾ to 1¾ inches wide, on petioles ½ to 2 inches long; flowers peduncled, several in somewhat loose terminal cymes; calyx-lobes orbicular-ovate, the attenuate apex nearly as long as the body; corolla violet-purple, ½ to 1 inch long; carpels rugulose-reticulate, 1 line long.

Dry flats, 400 to 3000 feet: upper Salinas Valley, east to the upper San Joaquin Valley and its bounding foothills. Mar.-May.

Note on infl.—The flowers are borne in clusters on the ends of the main stem or main branches; soon after anthesis they become remote and seem as if axillary but are in reality terminal and cymose. Meantime their peduncles elongate conspicuously, in fruit attaining a length of 1½ to 6 inches. In the branch-bearing axils supplementary flowering branches next develop alongside the fruiting peduncles.

Locs.—Paso Robles, *Barber;* White Hills, n. side of Cuyama Valley, San Luis Obispo Co., *Eastwood;* Zapato Chino Creek near Coalinga, *Jepson* 15,360; Shafter, *Allison Krames;* Buena Vista Hills, head of San Joaquin Valley, *Eastwood;* Bakersfield, *Davy* 1703; Poso Creek, Greenhorn foothills, *Hall* 5020; Caliente Creek, Tehachapi Mts., *Davy* 1940.

Refs.—SPHAERALCEA PARRYI Jepson, Man. 633 (1925). *Malvastrum parryi* Greene, Fl. Fr. 108 (1891), type loc. Monterey Co., *Parry. Eremalche parryi* Greene, Lflts. 1:208 (1906).

4. **S. palmeri** Jepson. CAMBRIA MALLOW. Stems stout, herbaceous, markedly and equably leafy to the summit, 6 to 8 feet high; herbage stellate-pubescent, or the leaves glabrous and shiny above; leaf-blades broad- or round-ovate, mostly 3 (sometimes 5)-lobed, dentate, truncate or cordate at base, dark green, 1 to 2½ inches long; stipules lanceolate, 2 to 6 lines long; flowers sessile in a terminal head-like cluster, rarely with a small supplementary cyme below, all the clusters dense, 1 to 2 inches wide, subtended by conspicuous foliaceous bracts; bractlets linear to ovate, nearly equaling the calyx-lobes; calyx-lobes ovate, acuminate; petals light pink, 7 to 12 lines long, the transverse crests near base with hairy tufts at each end and somewhat hairy in the middle.

Hill slopes, 50 to 1000 feet: foothills of the Santa Lucia Mts. May-July.

Locs.—El Monte ranch road, Monterey, *Hall* 10,084; betw. King City and Jolon, *Eastwood;* Cambria, San Luis Obispo Co., *Winifred Davis.*

Refs.—SPHAERALCEA PALMERI Jepson, Man. 633 (1925). *Malvastrum palmeri* Wats. Proc. Am. Acad. 12:250 (1877), type loc. Cambria, San Luis Obispo Co., *Palmer* 50. *Malacothamnus palmeri* Greene, Lflts. 1:208 (1906). *Malvastrum involucratum* Rob.; Gray, Syn. Fl. 1^1:310 (1897), type loc. Jolon, Monterey Co., *T. Brandegee* (leaves glabrous on upper surfaces, flowers 10 lines long).

5. **S. densiflora** Jepson. SAN JACINTO MALLOW. Stems erect, woody below, 2 to 4 feet high; herbage finely stellate-tomentose; leaf-blades orbicular-cordate, dentate, not lobed or often 3-lobed, 1 to 1¾ inches wide, the petioles 3 to 11 lines long; flowers in dense sessile heads (often appearing as if in whorls), forming an interrupted naked or leafy spike; bractlets conspicuous, filiform, densely hispid, 5 to 6 lines long; calyx hirsute-stellate, often papery-white in age, its lobes lanceolate, acuminate, 4 lines long; petals rose-red, 6 to 8 lines long.

Valleys and cañons, 1000 to 4100 feet: San Jacinto Mts.; Santa Ana Mts.; eastern San Diego Co. South to Lower California. May-June.

Locs.—Santiago Peak, Santa Ana Mts., *Munz* 7099; San Juan Capistrano, *Nevin;* Dripping Spr., Temecula Creek, *Munz* 10,427; Menifee, *Alice King;* Palm Cañon of San Jacinto, *Jepson* 1387; Witch Creek, San Diego Co., *Alderson* 418; Alpine sta., San Diego Co., *Parish* 4427.

Var. **viscida** Jepson comb. n. Calyx-segments 1½ to 3½ lines long; bractlets 2 to 3 lines long.—Chaparral slopes, 1000 to 2000 feet: San Diego Co. (Ramona, *K. Brandegee;* Tecate, 13 mi. se., *Munz* 9506).

Var. **gabrielensis** Jepson comb. n. Stipules elongate; flowers in glomerules in the upper axils; bractlets 3½ to 6 lines long; calyx-lobes ovate, subulate-attenuate, 4 to 5 lines long, in bud forming a slender beak; petals 8 to 9 lines long.—Mountains on west side of the Mohave Desert, 2400 to 3100 feet; Mt. Hamilton Range.

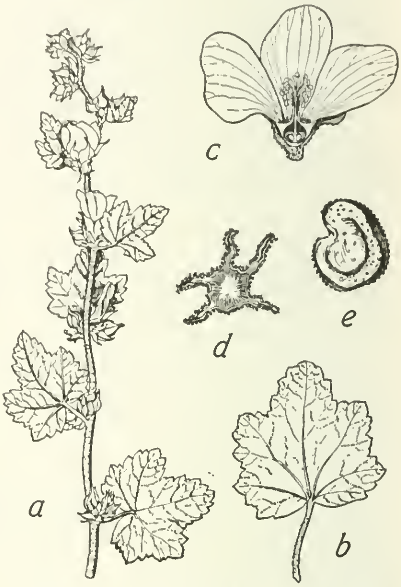

Fig. 240. SPHAERALCEA ABORIGINUM Jepson. *a*, flowering branch, × ⅓; *b*, basal leaf, × ⅓; *c*, long. sect. of fl., × ¾; *d*, cross sect. of calyx in bud, × 1½; *e*, nutlet, × 5.

Locs.—Ravenna, *K. Brandegee;* Arrastre Creek, n. side San Gabriel Mts.; Mt. Pinos (Bull. S. Cal. Acad. 24:86); mts. s. of Livermore, *Curran.*

Refs.—SPHAERALCEA DENSIFLORA Jepson, Man. 633 (1925). *Malvastrum densiflorum* Wats. Proc. Am. Acad. 17:368 (1882), type loc. Agua Caliente (Palm Sprs.), San Jacinto Mts., *S. B. & W. F. Parish. Malacothamnus densiflorus* Greene, Lflts. 1:208 (1906). *Malvastrum densiflorum* var. *typicum* Estes, Bull. S. Cal. Acad. 24:85 (1925). Var. VISCIDA Jepson. *Malvastrum viscidum* Abrams, Bull. Torr. Club 34:264 (1907), type loc. El Nido, San Diego Co., *Abrams* 3528. *M. densiflorum* var. *viscidum* Estes, Bull. S. Cal. Acad. 24:85 (1925). Var. GABRIELENSIS Jepson. *Malvastrum gabrielense* M. & J. Bull. Torr. Club 52:223 (1925), type loc. Arrastre Creek, n. side San Gabriel Mts., *Peirson* 774.

6. **S. aboriginum** Jepson comb. n. INDIAN MALLOW. (Fig. 240.) Stems with a dense white felt; leaf-blades broadly ovate, 3 to 5-lobed, crenate-dentate, cordate at base with a shallow and narrow sinus, obtuse at apex, 1½ inches long, somewhat broader, rugulose above, scarcely paler beneath; petioles nearly as long; flowers sessile and glomerate, forming an elongated flexuous almost naked interrupted inflorescence; bractlets 3, ovate, 4 to 5 lines long, 3 to 3½ lines wide, sometimes slightly connate at base; calyx plicate-angled, its lobes broader than long, abruptly acuminate; carpels (ex original character) about 8.

Dry hills, 700 to 1400 feet: middle South Coast Range in San Benito and Monterey counties. June.

Locs.—Only two stations are known to us: Bear Valley, San Benito Co., *Jepson* 12,243; and "Indian Valley", the original station. This Indian Valley would seem to be the one in s. Monterey Co. near the Salinas River (e. of Bradley). In Bull. Cal. Acad. 1:275, for other material collected by M. K. Curran, we find locality and date given as "Indian Valley near the Salinas River, June, 1885". This date doubtless identifies the "Indian Valley" cited for *Malvastrum aboriginum* Rob.—Jos. A. Ewan.

Refs.—SPHAERALCEA ABORIGINUM Jepson. *Malvastrum aboriginum* Rob.; Gray, Syn. Fl. 1^1:311 (1897), type loc. "Indian Valley, *M. K. Curran*, June, 1885."

7. **S. orbiculata** Jepson comb. n. TEHACHAPI MALLOW. Stems erect, 2 to 6 feet high, stellate-tomentulose and slightly brownish, the leaves less densely pubescent and greenish; leaf-blades round-cordate, dentate, somewhat shallowly or obscurely lobed, ¾ to 2 inches long; flowers in compact or subcapitate clusters consisting of 2 or 3 extremely abbreviated racemes; clusters peduncled or sessile or densely glomerate in the leaf axils and thus forming an interrupted spicate panicle; upper leaves of the panicle reduced to mere bracts or sub-obsolete; bractlets linear, 2 to 3 lines long; calyx-lobes ovate, acute to long-acuminate, enervate or 1-nerved on back, 3 to 3½ lines long; petals rose-color, changing in age to yellow, 6 to 7 lines long; carpels glabrous on the back and sides, hairy-tufted and densely tomentulose at apex, 1-nerved on back.

Dry hill slopes or cañons, 2400 to 6300 feet: mountains bordering the west half of the Mohave Desert. June-Aug.

Tax. note.—The distribution of Sphaeralcea orbiculata is such as to supplement that of S. densiflora and, if merged with it, to make a natural range. Sphaeralcea orbiculata in fact differs from S. densiflora very slightly; the most critical difference relates to length of pubescence; and it is only by virtue of a concession to the importance that is attached to pubescence in a group where more definite morphological differentiae are weak or lacking that Sphaeralcea orbiculata is here somewhat reluctantly retained in specific status.

Locs.—Erskine Creek, s. Sierra Nevada, Kern Co., *Purpus* 5285; Mt. Frazier, *Elmer* 3895; Mt. Pinos, *Hall* 6436; Rock Creek, n. side San Gabriel Mts., *Peirson* 502; Cushenbury Sprs., n. side San Bernardino Mts., *Parish.*

Var. clementina Jepson comb. n. Herbage more loosely pubescent, the stellate hairs longer than in the species; leaves greenish above, canescent beneath; inflorescence a very dense interrupted spike.—Rock crevices: San Clemente Isl. (Lemon Tank, *Peirson* 3458).

Refs.—SPHAERALCEA ORBICULATA Jepson. *Malvastrum orbiculatum* Greene, Fl. Fr. 109 (1891), type loc. mountains south of Tehachapi town, Kern Co., *Greene*. *Malveopsis fremontii* Dav. Erythea 2:63 (1894); not Malvastrum fremontii Torr. (1849). *Malacothamnus orbiculatus* Greene, Lflts. 1:208 (1906). *Malvastrum fremontii* var. *orbiculatum* Jtn. Pl. World 22:109 (1919). Var. CLEMENTINA Jepson. *Malvastrum clementinum* M. & J. Bull. Torr. Club 51:296 (1924), type loc. Lemon Tank, San Clemente Isl., *Munz* 6684.

8. **S. davidsonii** Jepson. SAND MALLOW. Stems robust, erect, 6 to 14 feet high; herbage densely stellate-tomentose; leaf-blades round-cordate, 5-angled or 5-lobed, denticulate or crenate, thick, rugose, prominently veined beneath, ¾ to 5½ inches long; flowers in short simple or forking racemes, the racemes sessile or usually peduncled, 2 or 3 in each leaf axil, ½ to 3½ inches long, and thus forming an interrupted panicle 12 to 18 inches long; bractlets short; calyx-lobes ovate, acute; petals rose-color, changing in age to yellow, 6 to 7 lines long; carpels glabrous on the back and sides, hairy-tufted and densely tomentulose at apex, 1-nerved on back.

Sandy washes or valleys or dry hillsides, 500 to 1500 feet: coastal Southern California from the Ojai Valley to the San Fernando Valley. May-June.

Locs.—Ojai Valley, *Peckham;* San Fernando Valley (Erythea 4:68); La Tuna Cañon, Verdugo Hills, *MacFadden* 2957; La Canada (Abrams, Fl. Los Ang. ed. 2, 229).

Refs.—SPHAERALCEA DAVIDSONII Jepson, Man. 634 (1925). *Malvastrum davidsonii* Rob.; Gray, Syn. Fl. 1^1:312 (1897), type loc. San Fernando Valley, *Davidson*. *Malacothamnus davidsonii* Greene, Lflts. 1:208 (1906). *Malvastrum splendidum* Dav. Erythea 4:68 (1896); not M. splendidum Kell. (1855).

9. **S. arcuata** Arthur. CAÑON MALLOW. Stems slender, woody below, 2 to 5 feet high; herbage covered with a dense or felt-like white tomentum; leaf-blades ovate or ovate-orbicular, dentate, slightly or not at all lobed, truncate at base, more

or less rugose, becoming green above, ¾ to 2 inches long, on petioles ¼ to 1¼ inches long; flowers in dense or head-like clusters sessile in the upper axils and at the ends of the branches, forming long interrupted spikes; bractlets linear-filiform, equaling the rusty-tomentose calyx; petals rose-color, 7 to 9 lines long; fruit 2 to 2½ lines wide, the carpels tomentulose on back, at length glabrate.

Bushy cañons in the foothills, 50 to 800 feet: Santa Cruz Mts. (mainly or wholly east slope); west slope Mt. Hamilton Range. May-July.

Locs.—Belmont (w. of), San Mateo Co., *Greene;* Crystal Sprs., San Mateo Co., *Henry Edwards;* Stanford, *C. F. Baker* 3438; hills n. of Big Basin, Santa Cruz Mts., acc. *C. A. Reed;* Alum Rock, Mt. Hamilton foothills, *C. A. Anderson.*

Refs.—SPHAERALCEA ARCUATA Arthur, Torreya 21:11 (1921); Jepson, Man. 634 (1925). *Malveopsis arcuata* Greene, Man. Reg. S. F. Bay 66 (1894), type loc. Coast Range back of Belmont (San Mateo Co.), *Greene. Malvastrum marrubioides* Greene, Fl. Fr. 109 (1891); not M. marrubioides D. & H. (1855). *Malvastrum arcuatum* Rob.; Gray, Syn. Fl. 1^1:311 (1897); Jepson, Fl. W. Mid. Cal. 242 (1901), ed. 2, 261 (1911). *Malacothamnus arcuata* Greene, Lflts. 1:208 (1906).

10. **S. fremontii** Jepson. WHITE-COAT MALLOW. Stems stout, woody at base, 2 to 5 feet high; herbage densely white-tomentose; leaf-blades very thick, orbicular-ovate, not lobed or shallowly 5 to 7-lobed, crenate, 1½ to 4 inches broad, on petioles ½ to 1 inch long; flower-clusters somewhat head-like or close, the heads sessile in the axils or short-peduncled and thus interrupted-spicate at summit of stem; calyx globose-ovate in bud, conspicuously and very densely and closely woolly, only the subulate tips of the lobes visible, almost equaled by the 3 linear-setaceous bractlets of the involucre; corolla pale pink or rose-color, aging white-scarious, 7 to 8 lines long; carpels smooth, promptly dehiscent.

Open hills, 200 to 1500 feet: inner North Coast Range foothills in Tehama Co.; Sierra Nevada foothills from Amador Co. to Tulare Co. Apr.-Aug.

Locs.—Inner North Coast Range: Yollo Bolly foothills, Tehama Co., *T. Brandegee.* Sierra Nevada foothills: Ione, Amador Co., *Braunton* 1144; Gwin Mine, Calaveras Co., *Jepson* 1765; betw. Watson Spr. and Cedar Creek, North Fork Kaweah River, *Jepson* 597; Springville, Tulare Co., *Purpus* 5664. The number of known localities is few, and in general there are relatively few individuals in a locality.

Var. **cercophora** Jepson. DIABLO MALLOW. Calyx-buds globose but attenuate at apex into a short point; calyx-lobes attenuate-caudate.—Mt. Diablo and Mt. Hamilton ranges: Nortonville, *K. Fenley;* Mt. Diablo, *Greene;* Corral Hollow, *Brewer* 1223; Arroyo del Valle, *Greene;* Calaveras Valley, *E. Brooks.*

Var. **exfibulosa** Jepson var. n. Many-stemmed shrub 4 to 5 feet high; leaves densely stellate-pubescent, but not woolly, greener above; cymes borne on peduncles 2 to 9 lines long or the uppermost flowers sessile; flower-buds subglobose; bractlets narrowly linear, ovate-dilated at base or at least a little dilated.—(Folia dense stellati-pubescentia; pedunculi cymae 2–9 lin. longi; alabastria subglobosa; bracteolae lineares, ad basin dilatatae).—Western Yolo Co.: Putah Creek, in gravel bed, near Winters, *Jepson* 16,741 (type); Capay Valley, *Lemmon.* The relationships of this variety are uncertain. The cymes in the species form dense clusters closely sessile against the stem axis. In this variety the cymes are very loose and mostly peduncled. It is evergreen.

Refs.—SPHAERALCEA FREMONTII Jepson, Man. 633 (1925). *Malvastrum fremontii* Torr.; Gray, Mem. Am. Acad. 4:21 (1849), type from "interior of California", *Fremont;* Jepson, Fl. W. Mid. Cal. 242 (1901), ed. 2, 261 (1911). *Sphaeralcea lindheimeri* Wats.; B. & W. Bot. Cal. 1:86 (1876), in part. *M. marrubioides* D. & H. Jour. Acad. Phila. ser. 2, 3:38 (1854), type loc. Millerton, San Joaquin River, Sierra Nevada foothills, *Heermann;* Pac. R. Rep. 5:6, pl. 2 (1855); leaf-blades ovate, dentate; pubescence perhaps less dense. The Lower California specimen (Santo Tomas, *Orcutt*), cited in Syn. Fl. (1^1:311), is S. densiflora Jepson. Var. CERCOPHORA Jepson, Man. 634 (1925). *Malvastrum fremontii* var. *cercophorum* Rob.; Gray, Syn. Fl. 1^1:311 (1895), type loc. Arroyo del Valle, Alameda Co., *Greene;* Jepson, Fl. W. Mid. Cal. 242 (1901), ed. 2, 261 (1911). Var. EXFIBULOSA Jepson.

11. **S. fasciculata** Arthur. MESA MALLOW. Stems 3 to 8 feet high, woody below, with long slender wand-like branches; pubescence short and close; leaf-blades round-ovate, dentate, not lobed or obscurely lobed or pentagonal, mostly truncate or subcordate at base, ¾ to 1¼ (or 2½) inches long; petioles 5 to 8 lines long; buds subacute; flowers in sessile or short-peduncled, often head-like, clusters, the clusters distant, or at least not crowded, but virgately racemose, the inflores-

cence often a little leafy below; calyx-lobes triangular-ovate, obtuse or with a very short point; petals rose-pink, unsymmetrical, 5 to 10 lines long; fruit 2 to 2½ lines wide, the carpels smooth, loosely pubescent, promptly dehiscent.

Dry hill slopes or mesas, 150 to 5000 (or 8000) feet: cismontane Southern California from Santa Barbara Co. to San Diego Co.; southwestern Colorado Desert. South to Mexico. Apr.-July.

Locs.—Bishop Ranch, Sisquoc River, Santa Barbara Co., *M. S. Baker;* Ojai Valley, Ventura Co., *Olive Thacher* 24; Azusa, Los Angeles Co., *C. F. Baker* 1558; San Antonio Cañon, San Gabriel Mts., *Peirson* 114; San Bernardino Mts., s. slope, *Parish* 7136; Riverside, *Jepson* 1220; Mt. San Jacinto, *Hall* 751; El Toro Peak, Santa Rosa Mts., *Hall* 765; betw. Bonsall and Pala, *Wiggins* 3055; Cajon Hills, San Diego Co., *G. W. Dunn;* San Diego, *C. F. Baker* 1626; Carrizo Creek, e. San Diego Co., *T. Brandegee.*

Var. **laxiflora** Jepson. Inflorescence elongated or tending to be racemose, thus becoming more or less open and paniculate.—Santa Barbara Co. to western Riverside Co.

Locs.—Montecito, Santa Barbara, *Eastwood* 198; Santa Catalina Isl., *K. Brandegee* (calyx pubescence of longer hairs, panicles very floriferous, thus intermediate towards var. nesiotica); Los Angeles, *Davidson;* Azusa, *Abrams* 1558; San Bernardino, *Parish* 3804; Corona, *Munz* 9865.

Var. **jonesii** Jepson comb. n. Sweet Mallow. Stems slender; leaf-blades suborbicular, scarcely or not at all lobed, crenate-dentate, equally hoary on both sides (the veins not prominent), small (½ to 1 inch long); flowers 1 to 3 in the upper axils.—Dry hills, Santa Lucia Mts.: above Nacimiento River, *Brewer* 554. Foliage fragrant.

Var. **nuttallii** Jepson comb. n. Leaves equally hoary on both sides; flower-clusters paniculate.—Hill slopes and cañons, 500 to 1200 feet: Santa Ynez River, *K. Brandegee;* Santa Ynez Mts., *Elmer* 3730; coastal Ventura Co.

Var. **elmeri** Jepson var. n. Similar to var. laxiflora; leaf-blades mostly suborbicular, crenately 3 to 5-lobed, the margins crenate; flower-clusters racemose.—(Var. laxiflorae similis; folia plerumque suborbiculata, 3–5-crenato-lobata, marginibus crenatis; flores racemosi.)—Stony slopes, 900 to 1200 feet: Mt. Diablo (*Elmer* 4395, type); Mt. Hamilton Range (Pacheco Pass, *Bolander* 4839).

Var. **nesiotica** Jepson comb. n. Similar to var. laxiflora; leaves glabrate above, very closely and minutely stellate-pubescent beneath; leaf-blades pentagonal to roundish-ovate, shallowly 3 to 5-lobed, crenulate, green and subglabrous above, prominently veined beneath, 1 to 3 inches long; flowers in a fastigiate nearly leafless panicle, its branches many, ascending.—Santa Cruz Isl., *Mason* 4089.

Refs.—SPHAERALCEA FASCICULATA Arthur, Torreya 21:11 (1921); Jepson, Man. 634 (1925). *Malva fasciculata* Nutt.; T. & G. Fl. 1:225 (1838), type loc. "Santa Barbara" (more probably San Diego), *Nuttall. Malvastrum fasciculatum* Greene, Fl. Fr. 108 (1891); Jepson, Fl. W. Mid. Cal. 242 (1901), ed. 2, 261 (1911). *Malveopsis fasciculata* Ktze. Rev. Gen. Pl. 1:72 (1891). *Malacothamnus fasciculatus* Greene, Lflts. 1:208 (1906). *Malvastrum fasciculatum* var. *typicum* Estes, Bull. S. Cal. Acad. 24:83 (1925). *M. thurberi* Gray, Mem. Am. Acad. ser. 2, 5:307 (1854), type loc. Santa Cruz, Sonora, Mex., *Thurber.* Var. LAXIFLORA Jepson, Man. 634 (1925). *Malvastrum thurberi* var. *laxiflorum* Gray, Proc. Am. Acad. 22:291 (1887). *M. splendidum* Kell. Proc. Cal. Acad. 1:65 (1855), type loc. Los Angeles, *Wm. A. Wallace. Malveopsis splendida* Ktze. Rev. Gen. Pl. 1:72 (1891). *Malvastrum fasciculatum* Dav. List Pl. Los Angeles Co. 3 (1892); not M. fasciculatum Greene (1891). *Malacothamnus fasciculatus splendidus* Abrams, Bull. N. Y. Bot. Gard. 6:417 (1910). *Malvastrum fasciculatum* var. *laxiflorum* M. & J. Bull. Torr. Club 51:296 (1924). Var. JONESII Jepson. *Malvastrum jonesii* Munz, Bull. S. Cal. Acad. 24:88 (1925), type loc. Paso Robles, San Luis Obispo Co., *Jones* 223. Var. NUTTALLII Jepson. *Malacothamnus nuttallii* Abrams, Bull. N. Y. Bot. Gard. 6:417 (1910), type loc. Casitas Pass, Ventura Co., *Abrams. Malvastrum nuttallii* Dav. & Mox. Fl. S. Cal. 233 (1923). Var. ELMERI Jepson. Var. NESIOTICA Jepson. *Malvastrum nesioticum* Rob.; Gray, Syn. Fl. 1^1:312 (1897), type loc. Santa Cruz Isl., 1886, *Greene. M. thurberi* Bdg. Zoe 1:133 (1890); not M. thurberi Gray (1854). *M. thurberi* var. *laxiflorum* Gray, Proc. Am. Acad. 22:291 (1887), in small part; Greene, Bull. Cal. Acad. 2:392 (1887). *Malacothamnus nesioticus* Abrams, Bull. N. Y. Bot. Gard. 6:419 (1910). *Sphaeralcea nesiotica* Jepson, Man. 634 (1925).

12. **S. orcuttii** Rose. Carrizo Mallow. Stems erect, 1 or several from the base, 1¼ to 3 feet high; herbage thinly stellate-puberulent or canescent; leaf-blades ¾ to 2 inches long, ovate in outline, truncatish at base, the lateral angles toward the base commonly enlarged so that the blade is somewhat 3-lobed with flowing outline, the margin entire or crenulate; flowers in short racemes in the upper axils, the upper leaves mostly reduced and bracteate, the inflorescence thus interruptedly spicate; calyx 2 to 3 lines long; corolla bright terra-cotta or red, 3 to 4 lines long; carpels 1 line long, reniform in outline from the strong recurving

of the empty scarious apex, thin-walled or subscarious, deeply reticulate on the sides, the areola often dark-colored; seed 1.

Arid plains, –60 to 2700 feet: Colorado Desert. Mar.-Aug.

Locs.—Meloland, *Parish* 8097; Dixieland, *Parish* 9020; Imperial, *T. Brandegee;* Signal Mt., *T. Brandegee;* Calexico, *Davy* 7953; Coyote Wells, *Newlon* 404.

Refs.—SPHAERALCEA ORCUTTII Rose, Contrib. U. S. Nat. Herb. 1:289 (1893), type loc. Carrizo Creek, Colorado Desert, *Orcutt* 2210; Jepson, Man. 634 (1925).

13. **S. eremicola** Jepson. PANAMINT MALLOW. Stems slender, erect or ascending, several from the thick root-crown, 12 to 17 inches high, green and glabrous or nearly so; leaf-blades roundish-cordate in outline, 4 to 11 lines long, 3 to 5-parted with the lobes again cleft and toothed, thinly stellate-puberulent, green; flowers few in a loose and narrow nearly naked panicle; calyx woolly, its tube 1½ to 2 lines long, almost as long as the fruit, the lobes lanceolate, acuminate, 4 to 5 lines long; bractlets filiform, about as long as calyx-tube; petals apricot-color, 7 to 8 lines long; fruit subglobose, 3 to 4 lines wide, its carpels oblong, stellate-tomentose dorsally, obscurely reticulate on lower portion of sides, 2¼ lines long.

Desert washes, 4000 to 4400 feet: Panamint Range, Inyo Co. May.

Tax. note.—This species is only slightly known but probably occurs elsewhere in the arid region east of the Sierra Nevada. It is related to S. incana Torr. of Arizona and may be the same as the plant referred to under that name by Greene, Fl. Fr. 110.

Ref.—SPHAERALCEA EREMICOLA Jepson, Man. 635 (1925), type loc. Emigrant Cañon, Panamint Range, *Jepson* 7120.

14. **S. angustifolia** Don var. **cuspidata** Gray. VALLEY NIGGER WEED. Stems many from the base, 3 to 4 feet high; herbage finely puberulent, the older stems and upper side of leaves glabrate; leaf-blades oblong- to linear-lanceolate, sometimes with 1 more or less obscure lobe at the basal angle on each side, minutely and irregularly crenulate, ¾ to 3 inches long; flowers in few-flowered clusters in the axils of the upper leaves; calyx-lobes ovate, acuminate, 2 lines long; corolla saffron-red, 3 to 4 (or 6) lines long; fruit globose, 2 to 3 lines wide, the sides of the carpels smooth above, reticulate below, usually with an erect cusp at apex.

Desert plains, –20 to 1500 feet: Colorado Desert. East to Kansas and Texas, south to Mexico. Aug.-Oct.

Locs.—Gruendyke Well, Chuckwalla Valley, *Jaeger* 1174; betw. Dos Palmas and Mecca, *L. J. Childs;* Indio, *Parish* 8319.

Var. **gavisus** Jepson var. n. Herbage stellate-tomentulose; leaf-blades broadly lanceolate to ovate but 3-lobed with the lateral lobes reduced or obsolete and the middle lobe much elongated, 1 to 2¼ inches long, the margin irregularly serrate; inflorescence leafy; corolla pale pink, 7 to 9 lines long.—(Herbae stellati-tomentosae; folia late lanceolata vel ovata, 3-lobata, lobis lateralibus reductis vel obsoletis, lobo terminale elongatissimo, unc. 1–2¼ longo, margine irregulariter serrato; inflorescentia foliosa; corolla albido-punicea, lin. 7–9 longa.)—Colorado River Valley: Bard, *Jepson* 5297 (type).

Refs.—SPHAERALCEA ANGUSTIFOLIA Don, Gen. Syst. 1:465 (1831). *Malva angustifolia* Cav. Diss. 2:64, t. 20, fig. 3 (1790), type from Mexico; Hook. Bot. Mag. t. 2839 (1827). *Sphaeroma angustifolia* Schlecht. Linnaea 11:353 (1837). Var. CUSPIDATA Gray, Proc. Am. Acad. 22:293 (1887); Jepson, Man. 635 (1925). *Sida stellata* Torr. Ann. Lyc. N. Y. 2:171 (1828), type loc. "sources of the Arkansas" (River), *James;* not S. stellata Cav. (1790). *Sphaeralcea stellata* T. & G. Fl. 1:228 (1838). *S. cuspidata* Britt.; Britt. & Br. Ill. Fl. 3:519 (1898). *Phymosia cuspidata* Britt.; Britt. & Br. Ill. Fl. ed. 2, 2:522 (1913). Var. GAVISUS Jepson.

15. **S. fendleri** Gray var. **californica** Parish. LANCE MALLOW. Stems erect, branching, finely puberulent but soon glabrate, 1½ to 3 feet high; leaf-blades lanceolate or lanceolate-linear to ovate-oblong, 3-lobed, cordate, subhastate or obtuse at base, crenate or subentire, gray-pubescent, upper surface green and often glabrate, ¾ to 3½ inches long; panicle elongated, narrow, the bracts foliaceous, linear-oblong and conspicuous or much reduced; corolla red or bright terra-cotta, 4 to 6 lines long; carpels minutely apiculate, 2½ lines long; seeds more or less short-hirsute.

Mesas and washes, 25 to 1500 feet: San Bernardino Valley; north side of Colorado Desert; eastern Mohave Desert. May-Nov.

Locs.—Colton, *Parish* 2846; Redlands, *Parish* 4613; Upland, *Parish* 11,174; Indio, *Jepson* 6037; Pleasant Valley, s. of Twenty-nine Palms, *Clary;* Hayfields, Chuckwalla Mts., *Clary* 447; Palo Verde Valley, *Jepson* 5263; Lavic, e. Mohave Desert, *Jepson* 15,450.

Refs.—SPHAERALCEA FENDLERI Gray, Pl. Wright. 1:21 (1852), type loc. El Paso, Tex., *Fendler.* Var. CALIFORNICA Parish, Zoe 5:71 (1900), type loc. Colton, San Bernardino Co., *Parish* 2846; Jepson, Man. 635 (1925).

16. **S. ambigua** Gray. APRICOT MALLOW. Stems often suffrutescent, several or many from the base, usually unbranched or simple above, erect or spreading, forming roundish clusters 1½ to 3 feet high, 1 to 4 feet broad; herbage finely but densely stellate-puberulent, or the stems whitish or yellowish-tomentulose; leaf-blades cordate to round-ovate, crenate, scarcely or not at all lobed to strongly 3-lobed or somewhat 5-lobed, ¾ to 1½ (or 2½) inches long, mostly as broad as long or somewhat broader; calyx 3 to 4 lines long, usually surpassing the fruit; bractlets filiform, hardly longer than calyx-tube; petals rose-red to brick-red, notched at apex, 5 to 10 lines long, the claws with a dense ciliate tuft of hairs on each side at base; stigmas black or purple; fruit globose-ovoid, 2½ lines high; carpels often cuspidate, the sides glabrous, smooth-chartaceous opposite the upper seed, reticulate-scarious opposite the lower seed, canescent on the back.

Arid plains and ranges in or bordering the deserts, 500 to 7600 feet: Inyo Co.; Mohave and Colorado deserts; San Bernardino Mts. to the Laguna Mts. East to Arizona. May-July.

Locs.—Inyo Co.: Andrews Camp, w. Inyo Co., *K. Brandegee;* Maturango Peak, *Purpus* 5448; Emigrant Cañon, Panamint Range, *Jepson* 14,081; Black Cañon, White Mts. (s. end), *Duran* 2623. Mohave Desert: Cima, *Jepson* 15,846; Ludlow, *Newlon* 520; Ord Mt., *Jepson* 5856; Barstow, *Jepson* 5837; Kramer, *Jepson* 5324; Shays Well, *Jepson* 5961; Twenty-nine Palms, *T. Brandegee.* Colorado Desert: Cottonwood Spr., Cottonwood Mts., n. of Mecca, *Jepson* 12,616; Painted Cañon, Mecca Hills, *Jepson* 11,649; County Well, n. of Indio, *Jepson* 6029; Palm Sprs. of San Jacinto, *Parish* 408; Deep Cañon, Santa Rosa Mts., *Clary* 786; Palm Cañon of San Ysidro, *Jepson* 8809; San Felipe Valley, e. San Diego Co., *Jepson* 12,452; Vallecito, e. San Diego Co., *Jepson* 8625. Cismontane S. Cal.: upper Santa Ana Cañon, *Hall* 7532; San Jacinto, *Jepson* 1247.

Var. **aculeata** Jepson var. n. Leaf-blades ovate-oblong, usually 3-lobed and subhastate, the middle lobe elongate; bracts inconspicuous, the lower foliaceous but much reduced, the upper usually obsolete; carpels 3 to 3½ lines long, tipped with a short erect cusp.—(Folia ovato-oblonga, plerumque 3-lobata et subhastata, loba media elongata; carpella lin. 3–3½ longa, cuspidata.)—Mohave Desert: West Palmdale, *Davy* 2293 (type); Bissell sta., *K. Brandegee;* Barstow, *K. Brandegee.* The following are less typical: Kramer, *K. Brandegee;* Cima, *K. Brandegee;* Providence Mts., *T. Brandegee* (cusps nearly obsolete).

Var. **pulchella** Jepson comb. n. Calyx rusty-pubescent; petals ¾ to 1 inch long; carpels smooth on sides or only faintly reticulate at base, densely woolly on back.—Cañons and mountain sides, 4000 to 6000 feet: Panamint Range; Argus Mts., *Wheeler & Richardson;* Coso Mts., *Hall & Chandler* 7108.

Var. **keckii** Munz. Flowers large; calyx 8 to 9 lines long; petals 1 to 1¼ inches long.—Chuckwalla Mts.

Refs.—SPHAERALCEA AMBIGUA Gray, Proc. Am. Acad. 22:292 (1886); Jepson, Man. 634 (1925). This binomial rests on *S. emoryi* Torr. Bot. Ives 8 (1860), "Big Cañon of the Colorado" (River), *Newberry;* not S. emoryi Torr. in Gray, Mem. Am. Acad. 4:23 (1849) and Pl. Wright. 21 (1852). Var. ACULEATA Jepson. Var. PULCHELLA Jepson. *S. pulchella* Jepson, Man. 635 (1925), type loc. Hanaupah Cañon, Panamint Range, *Jepson* 7064. Var. KECKII Munz, Bull. S. Cal. Acad. 31:68 (1932), type loc. Corn Sprs., *Munz & Keck* 4835.

17. **S. rosacea** M. & J. PARISH MALLOW. Similar to S. ambigua; stems white-pubescent or glabrate; leaves usually scantily pubescent, usually dark green, thinnish; panicles looser; corolla pink.

Washes or cañons, in rocky or sandy soil, 500 to 2500 feet: mountains on west side of the Colorado Desert from the San Jacinto Mts. to the Laguna Mts. Apr.

Note on variation.—The leaf-blades vary in size from ¾ to 2½ inches long, from grayish-pubescent to bright green, from cordate-ovate and subentire to cordate-ovate and 5-lobed, and are either rugose or not rugose. In its leaves S. ambigua shows a parallel range of variation.

In inflorescence, in calyces and in carpels, S. rosacea and S. ambigua are similar and variable in a parallel manner. There is, apparently, no constant difference between these two save in the color of the corolla. The specific status of S. rosacea, therefore, needs further investigation.

Locs.—Palm Sprs. of San Jacinto, *Parish* 4109; Palm Cañon of San Jacinto, *Gilman* 717; Deep Cañon, Santa Rosa Mts., *Clary* 783; Coyote Wells, San Diego Co., *T. Brandegee*; Myers Creek bridge, foot of Mountain Sprs. grade, *Jepson* 11,786.

Refs.—SPHAERALCEA ROSACEA M. & J. Bull. Torr. Club 49:353 (1922), type loc. Palm Sprs. of San Jacinto, *Alice B. Chittenden*. *S. purpurea* Parish; Jepson, Man. 635 (1925), type loc. Mountain Sprs., e. San Diego Co., *Parish* 9101.

18. **S. rivularis** Torr. var. **cismontana** Jepson var. n. MAPLE MALLOW. Stems erect, 2 to 3 feet high; herbage green, finely puberulent; leaves maple-like, the blades deeply 5-lobed (the lobes acute, irregularly serrate), truncate or subcordate at base, 2 to 6½ inches long; petioles ½ to 3¼ inches long; flower-clusters sessile or nearly so in the axils of the upper much-reduced leaves and thus interruptedly spicate at the summit of the branches; calyx-lobes ovate, acuminate, shorter than the mature carpels; petals rose-color, ¾ to 1 inch long; back of carpels densely puberulent and also conspicuously covered with long ascending bristles.—(Caules erecti, ped. 2–3 alti; herbae virides, minute puberulae; folia acerina, profunde 5-lobata (lobis acutis, irregulariter serratis) basi truncata vel subcordata, unc. 2–6½ longa; petioli unc. ½–3¼ longi; inflorescentia interrupte spicata, floribus in axillis foliorum superiorum reductorum aggregatis; calycis lobi ovati, acuminati, carpellis maturis breviores; petala rosea, unc. ¾–1 longa; carpella dorsaliter dense puberula, aciculis longis ascendentibus dense tecta.)

Cañons or openings at edge of forests, 500 to 2500 feet: Humboldt Co. June-July.

Locs.—Humboldt Co.: Bald Mt., *V. P. Fox;* Prairie Creek, *Tracy* 7585; Three Creeks, *Jepson* 2127 (type).

Refs.—SPHAERALCEA RIVULARIS Torr.; Gray, Mem. Am. Acad. 4:23 (1849). *Malva rivularis* Dougl.; Hook. Fl. Bor. Am. 1:107 (1830), "river banks of North-west America from the ocean to the Rocky Mts.," *Douglas*. *S. acerifolia* Nutt.; T. & G. Fl. 1:228 (1838), "rivulets east of Wallawallah" (Wash.), *Nuttall;* Hook. Bot. Mag. t. 5404 (1863). Var. CISMONTANA Jepson. *S. acerifolia* Jepson, Man. 635 (1925), as to Humboldt Co. plants.

19. **S. bakeri** Jepson. LAVA MALLOW. Stems erect, several from the root-crown, 1 to 1¼ feet high; herbage finely puberulent; blades of the lower leaves sub-orbicular, truncatish at base, crenately lobed and crenate, 3 to 12 lines long, the upper leaves often cuneate-obovate in outline, irregularly serrate on upper half or somewhat 3-lobed, ¾ to 1 inch long; flowers mostly solitary in the upper axils, on peduncles 2 to 7 lines long; calyx-lobes round-ovate, abruptly acuminate, 3 to 4 lines long; petals rose-pink, ¾ inch long; fruit 5 to 6 lines long; carpels closely puberulent and also densely covered with long ascending dull-white bristles.

Lava beds, 3200 to 4000 feet: boundary of Shasta and Modoc Cos. Aug.

Tax. note.—This species is too little known geographically. It is, however, quite different in general aspect from specimens of Sphaeralcea rivularis collected in the type region and north-east. It differs from the original description of S. rivularis Torr. as follows: (a) the flowers are usually solitary in the axils; (b) the bases of the leaf-blades are truncate or cuneate; (c) the blades of the upper leaves are often cuneate-obovate.

Locs.—Fall River Valley; betw. Hot Springs Valley (se. Modoc Co.) and Hills farm, upper Fall River Valley, *M. S. Baker* 554.

Ref.—SPHAERALCEA BAKERI Jepson, Man. 635 (1925), type loc. Fall River Valley, ne. Shasta Co., *M. S. Baker*.

8. HORSFORDIA Gray

Ours woody plants, the stems yellowish or greenish-yellow, covered with a dense felt. Leaves (in ours) with the blades ovate to ovate-lanceolate, cordate or subcordate at base, leathery or with a plush-like sheen, subentire or irregularly denticulate. Peduncles 1 to 3 in the axils or raised on a short axillary branchlet, each 1-flowered. Bractlets none. Calyx 5-lobed. Carpels 3-ovuled, 1 to 3-seeded; lower portion of carpel firm, reticulate on sides, 1-seeded, somewhat constrictedly divided from the upper scarious portion; scarious portion 1 or 2-seeded or empty, early 2-valved into a pair of erect or somewhat spreading wings which equal or exceed the basal portion. Seed of the reticulate portion of the carpels unlike the seed or seeds of the scarious portion.—Species 4, northwest Mexico, Lower California, Arizona and Southern California. (F. H. Horsford of Vermont, botanical collector.)

Corolla salmon-yellow or saffron; stigmas yellow; peduncles not jointed................1. *H. newberryi.*
Corolla lavender or pink; stigmas purple; peduncles jointed near the middle..................2. *H. alata.*

1. **H. newberryi** Gray. (Fig. 241.) Stem erect, 5 to 8 feet high, with lateral branches on upper ⅔; stems and petioles yellow, stellate-tomentose, the leaves with a somewhat paler or greenish-yellow but very dense and fine stellate tomentum; leaf-blades 1¼ to 2¾ inches long, on petioles ¼ to 1¼ inches long; petals orbicular, rotate, 3 lines long; anthers yellow; carpels 4 to 4½ lines long, the wings ovate, puberulent, 3½ lines long; seeds 2 or 3, densely pubescent.

Rocky cañons, 10 to 2000 feet: western Colorado Desert. South into Lower California and Sonora, east to Arizona. Apr.-May.

Locs.—Coral Reef ranch, Coachella, *Clary;* Toro Sprs. (Zoe 4:162); Palm Cañon of San Ysidro, *Jepson* 8811; Yaqui Well, *Jepson* 12,517; Carrizo Mt., *T. Brandegee;* Signal Mt., *T. Brandegee.*

Refs.—Horsfordia newberryi Gray, Proc. Am. Acad. 22:297 (1887); Jepson, Man. 636 (1925). *Abutilon newberryi* Wats. Proc. Am. Acad. 11:125 (1876), type loc. Canebrake Cañon, lower Colorado River, *Newberry.*

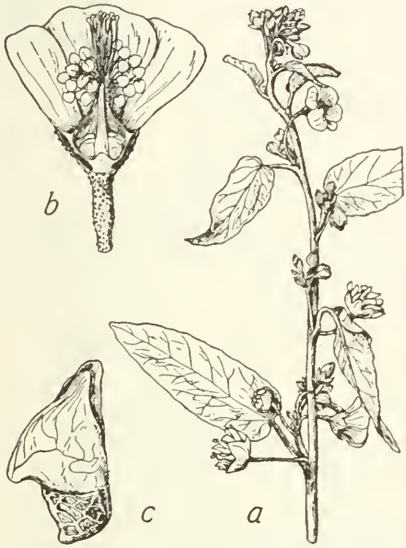

Fig. 241. Horsfordia newberryi Gray. *a*, flowering branch, × ½; *b*, long. sect. of fl., × 2; *c*, mature carpel, × 3.

2. **H. alata** Gray. (Fig. 242.) Stem yellow with a felt-like tomentum, erect, 3 to 11 feet high, woody below, with divaricate branches; leaf-blades stellate-pubescent on both sides, greenish above, a little pale beneath, abruptly short-acuminate to obtuse at apex, 1 to 4 inches long, on petioles ¼ to 2½ inches long; pedicels 4 to 8½ lines long, jointed near the middle; calyx-lobes ovate, acuminate; petals obovate, pale lavender (turning pale blue in drying), 6 to 7 lines long, hairy at very base; anthers white; carpels at apex, in the flowering stage, with 2 line-like ridges which during maturation of fruit develop into 2 free wings; fruiting carpels 4 lines long; wings glabrous, erosulate at apex; seeds 2 or 3, lightly pubescent.

Desert washes, at about sea-level: Conchilla Desert. Also in Arizona, Sonora and Lower California. Apr.-Dec.

Locs.—Coral Reef Ranch, *Clary* (3 stations known). Ariz.: Tinajas Altas Mts. (Jour. Wash. Acad. Sci. 21:73).

Refs.—Horsfordia alata Gray, Proc. Am. Acad. 22:297 (1887). *Sida alata* Wats. Proc. Am. Acad. 20:356 (1885), type loc. state of Sonora, Mex., 100 miles s. of U. S. boundary and 30 miles from the Gulf of California, *Pringle.*

9. **ABUTILON** Mill. Indian Mallow.

Perennial herbs or shrubs. Leaves with cordate blades. Flowers solitary in the axils or paniculate. Calyx without involucel. Petals commonly yellow. Carpels 4 to 30, united in a capsule, the carpels 3 to 9-ovuled, tardily separating or not at all, dehiscent dorsally and apically or at length 2-valved.—Species 90, all continents, mostly tropical. (Name perhaps Arabic.)

1. **A. parvulum** Gray. Desert Mallow. Stems slender, diffuse, 7 to 18 inches long; herbage puberulent, when young more or less ashy; leaf-blades rounded- or ovate-cordate, serrate, 4 to 7 (or 18) lines long; petioles 2 to 5 lines long; flowers solitary on axillary filiform peduncles 6 to 9 lines long; sepals 1½ lines long, reflexed beneath the capsule; petals pink, 2½ lines long; capsules quadratish, 3½ lines long, composed of 4 to 6 carpels, each 2 or 3-seeded.

Arid slopes, 3000 to 4000 feet: Providence Mts., eastern Mohave Desert. Arizona to Texas and Colorado. Apr.

Loc.—Bonanza King Mine, *Munz* 4206 (only known station in Cal.).

Refs.—Abutilon parvulum Gray, Pl. Wright. 1:21 (1852), San Felipe and San Pedro rivers, Tex., *Wright;* Jepson, Man. 1170 (1925).

STERCULIACEAE. Sterculia Family

Shrubs or trees with alternate leaves and perfect regular or nearly regular 5-merous flowers. Stamens united below into a tube. Ovary superior, 5 (or 4)-celled. Style in ours one, stigmatic at apex. Fruit a capsule.—Genera 48, species about 660, mostly tropical, all continents.

Bibliog.—Bentham, Geo., Notes on * * * Sterculiaceae (Jour. Linn. Soc. 6:110–123,—1862). Gray, A., Ordo Cheiranthodendreae (Proc. Am. Acad. 22:303–305,—1887).

Flowers yellow, showy; petals none; calyx-lobes with a conspicuous gland at base; ovary not stiped..1. Fremontia.
Flowers brownish, minute; petal-claws filiform, ending in a hood; calyx-glands none; ovary stipitate..2. Ayenia.

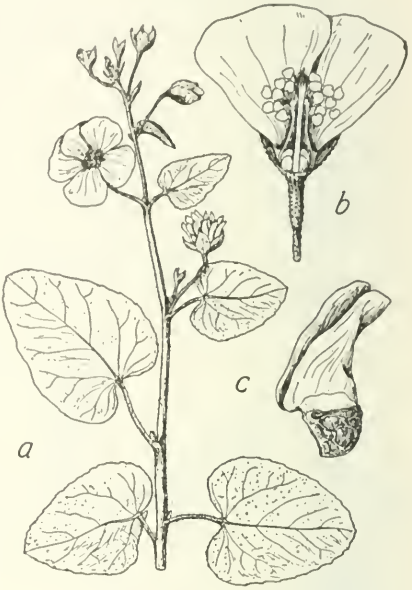

Fig. 242. Horsfordia alata Gray. *a*, flowering branch, × ½; *b*, long. sect. of fl., × 1½; *c*, mature carpel, × 3.

1. FREMONTIA Torr.

Evergreen shrub or small tree with small often lobed leaves and stellate pubescence. Flowers showy, short-pediceled, solitary and axillary on the branchlets. Stipules caducous. Bractlets 3 to 5, small. Calyx yellow and corolla-like, deeply 5-cleft into round-ovate lobes or sepals; these imbricated in the bud, the 3 inner a little larger, all with a rounded and sharply defined glandular area at base. Corolla none. Stamens 5; filaments united to the middle. Capsule 4 or 5-celled, loculicidally dehiscent.—Species 1. (General John C. Fremont, Pathfinder of the Rocky Mountains and Sierra Nevada, and first United States Senator from California, who discovered it.)

1. **F. californica** Torr. Flannel Bush. Loosely branching shrub 6 to 10 feet high, sometimes a small tree up to 18 feet high; branches tough and flexible, with many short leaf- and flower-bearing branchlets or spurs; leaf-blades orbicular to ovate, elliptic or oblong, irregularly lobed to entire, green above, covered beneath with a dense gray or whitish felt, ¼ to 1¼ inches long, or on sterile shoots somewhat larger; petioles short; calyx somewhat flannel-like, 1½ to 2 inches broad, persistent, the lobes commonly mucronate; glands hairy; capsule ovate,

covered with a dense brown felt and short bristly hairs, ¾ to 1⅛ inches long, persistent.

Dry hills, 1500 to 5500 feet: Coast Ranges from Mendocino Co. to San Luis Obispo Co.; Sierra Nevada from Tehama Co. to Kern Co.; coastal mountains of Southern California. May-July.

Geog. note.—In the Coast Ranges, the stations for Fremontia californica are rare or localized, as also in the northern Sierra Nevada foothills, but the shrub is abundant from Mariposa Co. to Kern Co., and is common on the north base of the San Gabriel and San Bernardino mountains though rare on the south side, being still rarer southward, but occurring in San Diego Co. The area of greatest development is in the foothills of Fresno, Tulare and Kern counties, where, as an important constituent of the chaparral, it often occupies a marked band 1 to 2 miles wide and illuminates the cañon sides with a glow of gold in its flowering period. Trunks in the southern Sierra Nevada foothills are 3 to 8 inches in diameter at a foot above the ground. Near Tehachapi station a tree 16 feet high had in 1917 a trunk diameter of 5⅔ inches at 4 feet above the ground; the trunk was 7 feet high. On the northeast slopes of Bear Mt. in the Tehachapi Mountains it forms a rather dense pygmy forest 12 to 15 feet high. Leaves on crown-shoots after chaparral fires have blades often 1½ to 2½ inches long.

Locs.—Coast Ranges: Cow Mt., Miyakma Range, acc. *Purdy;* Hell's Half-Acre, upper Putah Creek, s. Lake Co., *R. H. Platt;* Knoxville Ridge, ne. Napa Co., *Jepson* 9036; Madrone Falls, Berryessa grade, Napa Co., *J. W. Castner;* betw. North Fork Lewis Creek and San Benito River, se. Monterey Co., *Jepson;* San Luis Obispo, *J. E. Roadhouse.* Sierra Nevada: Paynes Creek, Tehama Co. foothills, *J. Grinnell;* Yosemite, *Alice King;* Bootjack, Mariposa Co., *Jepson* 12,786; Cedar Brook, Mariposa Co., *Jepson* 8405; Dunlap, Fresno Co., *Jepson* 2764; Whipstock Flat near Badger, Tulare Co., *Jepson;* Cedar Creek, North Fork Kaweah River, *Jepson* 592; Timber Pt., East Fork Kaweah River, *Jepson;* Grouse Valley, South Fork Kaweah River, *Jepson* 4705, 4714; North Fork Tule River near Milo, *Jepson;* Middle Tule River, *Jepson* 4859. Tehachapi Mts.: Tehachapi, *Jepson* 7425. S. Cal.: Cushenbury Cañon (Zoe 4:340); Rock Creek, San Gabriel Mts., *Peirson* 116; Bull Creek, San Jacinto Mts., *Hall* 958; Santa Rosa Mts., *Clary* 955; San Diego (Zoe 4:340).

Var. **mexicana** Jepson. Calyx-glands not hairy, or only slightly so, otherwise as in the species: Cazadero, comm. *J. W. Flinn;* Redwood Peak, Oakland Hills, *Docia Patchett;* San Luis Obispo Co., *Summers;* Ft. Tejon, *Davy* 2358; Mt. Pinos, *Hall* 6425; Lytle Creek Cañon, San Gabriel Mts., *Hall* 1222; and southward into Lower California.

Refs.—FREMONTIA CALIFORNICA Torr. Pl. Frem. 6 (1853), type loc. mts. at the upper end of the Sacramento Valley, *Fremont;* Jepson, Fl. W. Mid. Cal. 236 (1901), ed. 2, 262 (1911), Man. 626, fig. 629 (1925). *Fremontodendron californicum* Cov. Contrib. U. S. Nat. Herb. 4:74 (1893). Var. MEXICANA Jepson, Man. 637 (1925). *Fremontodendron mexicanum* Dav. Bull. S. Cal. Acad. 16:50 (1917), type loc. "15 mi. from San Diego", *Kate O. Sessions* (Davidson Herbarium 3234). *Fremontia mexicana* Mcbr. Contrib. Gray Herb. 53:14 (1918); Stapf, Bot. Mag. t. 9269 (1929).

2. AYENIA Loefl.

Small shrubby plants with small flowers. Calyx 5-parted. Petals with a long filamentous claw ending in a hood; hoods inflexed, adnate to the stamen-column and covering the anthers. Fertile stamens 5, these alternate with 5 truncate staminodia at summit of stamen-tube; anthers with 3 parallel cells. Ovary on a stipe, 5-celled, 2 ovules in each cell. Capsule globose, muricate, splitting septicidally into 5 one-seeded carpels which separate from a central column; carpels loculicidally 2-valved. Seeds strongly rugose; endosperm none.—Species about 15, North and South America. (Named for the Duc d'Ayen.)

1. **A. californica** Jepson. Stems several from the base, woody below, ½ to 1 foot high, or often diffuse or trailing and to 2⅓ feet long; herbage minutely puberulent or canescent; leaf-blades ovate to oblong-ovate, serrate, 3 to 10 lines long, the petioles ½ to 3 lines long; flowers 1 to 1¼ lines long, brownish; capsule 1¾ lines long.

Dry cañons, 100 to 1500 feet: mountains on the west side of the Colorado Desert. Mar.-Apr.

Locs.—Palm Sprs. of San Jacinto, *Parish* 4146; Santa Rosa Mts. (cañons sw. of Coachella Valley), *Clary* 656; San Felipe Narrows, e. San Diego Co., *Jepson* 12,526.

Ref.—AYENIA CALIFORNICA Jepson, Man. 637 (1925), type loc. Palm Cañon of San Jacinto, *Jepson* 1407.

HYPERICACEAE. St. John's Wort Family

Ours herbs or slightly suffrutescent plants. Leaves opposite, simple, without stipules and with entire blades and pellucid dots or dark glands. Flowers perfect, regular and hypogynous. Sepals 5 (in ours) or 4, herbaceous, persistent. Petals 5 (in ours) or 4, yellow (in ours). Stamens usually numerous, distinct or more or less united into 3 to 5 clusters. Ovary superior, 1 or 3-celled; styles in ours 3. Fruit a septicidal capsule. Seed without endosperm.—Genera 7, species 275, mostly warm temperate and tropical, well represented in all continents save Australia (1 species).

Bibliog.—Coulter, J. M., Revision of N. Am. Hypericaceae (Bot. Gaz. 11:78–88, 106–112,—1886). Keller, R., Zur Kenntnis der Sectio Brathys des Genus Hypericum (Bull. Herb. Boiss. ser. 2, 8:175–191,—1908). Sampson, A. W., St. John's Wort on range lands in California (Univ. Cal. Agr. Exp. Sta. Bull. 503:1–48, figs. 1–23,—1930). Ball, W. S., & Robbins, W. W., Klamath Weed (Mo. Bull. Cal. Dept. Agr. 23:103–108, fig.,—1934).

1. HYPERICUM L. St. John's Wort

Leaves with sessile blades. Flowers in terminal cymes, rarely solitary. Petals deciduous or marcescent.—Species 200, all continents. (Ancient Greek name.)

Annuals; sepals longer than the petals; styles short; capsule 1-celled.
  Erect from the base, more or less branching; stamens 6 to 12..............1. *H. mutilum.*
  Procumbent, forming mats with ascending or erect branches; stamens 15 to 27.............. 2. *H. anagalloides.*
Perennials; petals much longer than the sepals; styles long, divaricately spreading; capsule 3-celled; stamens very numerous.
  Stems tall, few, from a rootstock; leaves not folded.
    Stems with numerous short sterile shoots; sepals lanceolate; capsule not lobed.............. 3. *H. perforatum.*
    Stems (proper) destitute of sterile shoots; sepals ovate; capsule 3-lobed..4. *H. formosum.*
  Stems low, numerous, from a woody crown; leaves commonly conduplicate; capsule 3-lobed.... 5. *H. concinnum.*

1. **H. mutilum** L. River St. John's Wort. Stem mostly simple below and branching above, 10 to 17 inches high; leaf-blades ovate, 5 to 10 lines long, 3 to 6 lines broad, 5-nerved at base, sessile; flowers in leafy cymes at the ends of the branches; stamens 6 to 12; sepals linear to lanceolate, mostly shorter than the capsule.

River shores, 5 to 50 feet: Sacramento River; lower San Joaquin River. Texas to Nova Scotia. Aug.-Sept.

Locs.—Castella, Shasta Co., comm. *K. Brandegee;* Newtown Ldg., Rio Vista, *Jepson* 13,964; Bouldin Isl. (Zoe 4:213).

Refs.—Hypericum mutilum L. Sp. Pl. 787 (1753), "Virginia, Canada"; Jepson, Fl. W. Mid. Cal. 235 (1901), ed. 2, 263 (1911), Man. 637 (1925).

2. **H. anagalloides** C. & S. Tinkers Penny. Stems producing prostrate runners and commonly forming dense mats 6 to 15 inches broad, with ascending or erect branches 2 to 5 (or 10) inches high; leaf-blades lanceolate to ovate or orbicular, obtuse, 5 to 7-nerved at base, 2 to 6 (or 9) lines long; flowers 1 to 1½ lines long, borne 1 to 3 in a leafy cyme, or the cyme becoming paniculate; petals salmon-color; sepals ovate or linear-oblong, unequal, longer than the capsule; stamens 15 to 21.

Springy places and streamlets in the hills and mountains, 500 to 8500 feet: almost throughout cismontane California, common northward. North to British Columbia and Montana, south to Lower California. June-Aug. It is very variable in size, branching and foliage.

Locs.—San Bernardino Mts., 6000 to 8500 feet: Little Bear Valley, *Parish;* High Creek, *Crawford* 894. Sierra Nevada, 4000 to 6000 feet: Kernville (Contrib. U. S. Nat. Herb. 4:256); Lion Mdw., Little Kern River, *Jepson* 1034; Huckleberry Mdw., Giant Forest, *Newlon* 49; Pine Ridge, Fresno Co., *Hall & Chandler* 134; Fresno Flats, Madera Co., *Jepson* 12,846; Strawberry, Tuolumne Co., *Jepson* 6521 (tips of the petals incoiled at night); Dorrington, Calaveras Co., *Jepson* 10,192; Auburn, *Shockley;* Yuba River at Cisco, *H. A. Walker* 1461; Manton, Tehama Co., *Jepson* 15,287; Pine Creek, Lassen Co., *Baker & Nutting.* Coast Ranges from San Luis Obispo Co. to Siskiyou Co., 500 to 5000 feet: Price Cañon, San Luis Obispo Co., *Condit;* Pacific Grove, *Heller* 6784; San Francisco (Zoe 2:343); Healdsburg, *W. E. Bryant;* Mt. Konocti, Lake Co., *Jepson;* Ft. Bragg, *W. C. Mathews;* Elk Mt., nw. Lake Co., *Tracy* 2280; Van Duzen River Valley opp. Buck Mt., *Tracy* 4272; Sisson, *Jepson* 13,956; Shackelford Creek, w. Siskiyou Co., *Butler* 1765.

Refs.—HYPERICUM ANAGALLOIDES C. & S. Linnaea 3:127 (1828), type loc. San Francisco, *Chamisso;* Jepson, Fl. W. Mid. Cal. 235 (1901), ed. 2, 263 (1911), Man. 637, fig. 630 (1925).

3. **H. perforatum** L. KLAMATH WEED. Stems simple but the main axis bearing many very leafy short sterile shoots and ending above in a densely flowered cyme, 1 to 4 feet high; leaf-blades linear to oblong, soon revolute, ½ to 1 inch long, those of the sterile shoots about ½ inch long; flowers ¾ to 1 inch broad; sepals lanceolate, acuminate, about 4 times as long as broad; petals linear-oblong, copiously black-dotted, twisting after anthesis.

European weed, a serious pest in abandoned or poorly tilled fields in the hill country, 500 to 3500 feet: northern California, in both the Sierra Nevada and outer Coast Ranges. May-June.

Biol. note.—The plant is furnished with a deep-seated taproot which sends up new shoots from the root-crown each season. These shoots serve as foliage shoots, but only one of them becomes a reproductive stem and develops an inflorescence. One shoot thus gains an ascendancy over the others and only one such flowering stem in a place has been observed by us. The other shoots at flowering or fruiting time may, ordinarily, be found only by investigating the base of the plant and observing the wisp of dried stems. At this time the flowering shoot produces also a number of young vegetative buds near the base; these develop leafy shoots during the succeeding moist season so that the work of producing reserve food goes on anew. The taproot, in addition, gives off short stolons which, on reaching the surface, also develop the short-lived leafy shoots, of the type just mentioned, and one reproductive shoot, which is of course leafy below.

Locs.—Coast Ranges: Santa Cruz (Univ. Cal. Agr. Exp. Sta. Bull. 503:6); Anderson Valley, Mendocino Co. (Univ. Cal. Agr. Exp. Bull. 503:6), Blue Rock Ridge, n. Mendocino Co., acc. *Kennedy;* Miranda, South Fork Eel River, Humboldt Co., *Jepson* 12,368; Rush Creek, Trinity Co., *H. S. Yates* 419; Hupa, *Jepson* 1984; Weaverville, *Yates* 358; High Prairie Creek, Del Norte Co., *Jepson* 9349; Anderson, Shasta Co., *Alice King;* Yreka, *W. L. Kleaver.* Sierra Nevada foothills: Dudley ranch, Coulterville, *J. Grinnell;* Columbia, Tuolumne Co., *Jepson* 6444; Folsom, *Hall* 10,220; Chicago Park, Nevada Co., *Hall* 10,210; Olinda, Shasta Co., *Blankinship.*

Refs.—HYPERICUM PERFORATUM L. Sp. Pl. 785 (1753), type European; Jepson, Man. 638 (1925).

4. **H. formosum** H.B.K. var. **scouleri** Coulter. Stems usually erect from running rootstocks, slender, simple or branching at summit, 1 to 3 feet high; leaf-blades ovate to oval or oblong, obtuse, black-dotted along the margins, sessile by a more or less clasping base, ½ to 1¼ inches long; flowers ½ to ¾ inch broad, in more or less panicled cymes; sepals and petals black-dotted; sepals ovate, mostly obtuse, sometimes acute, twice as long as broad; petals obovate; stamens numerous, in 3 clusters.

Openly wooded slopes, hills and mountains, 50 to 7500 feet: almost throughout California. North to Washington. July-Aug.

Locs.—S. Cal.: Cuyamaca, *T. Brandegee;* Witch Creek, *Alderson;* Palomar Mt., *Esther Hewlett* 22; Mt. San Jacinto, *Geo. F. Reinhardt;* Arrowhead Lake, San Bernardino Mts., *Braunton* 1062; Claremont (Bull. S. Cal. Acad. 17:65); Seymour Creek, Mt. Pinos, *Hall* 6681. Coast Ranges: Nacimiento River, sw. Monterey Co., *Jepson* 1698; Pajaro Hills, *Chandler* 411; Howell Mt., *Jepson;* Big Horse Mt., n. Lake Co., *Jepson;* Round Valley, Mendocino Co., *Westermann;* Patricks Pt., Humboldt Co., *Tracy* 4362; Grouse Creek, Humboldt Co., *Chesnut & Drew;* Koon ranch, South Fork Trinity River, *Tracy* 7699; Sisson, *Jepson* 13,961; Log Lake, Siskiyou Co., *Butler* 6; Oro Fino, Siskiyou Co., *Butler* 5; Goosenest foothills, *Butler* 1627; Crescent City, *M. S. Baker* 231b. Tehachapi Mts.: Tehachapi, *Davidson.* Sierra Nevada: Jordan Hot Sprs., Tulare Co., *Elsie Zeile;* Trout Mdws., Kern River, *Purpus* 1869; Huntington Lake, *A. L. Grant* 1120; La Grange, Tuolumne Co., *Jepson* 13,960; Yosemite, *Jepson* 8375; Hetch-Hetchy, *Jepson* 3468; Confidence, Tuolumne Co., *Jepson* 7709; Kennedy Lake, Tuolumne Co., *A. L. Grant* 208; Dorrington, Calaveras Co., *Jepson* 10,111; Glen Alpine, Eldorado Co., *Katharine Chandler;* Auburn, *Shockley;* Blairsden, Plumas Co., *Mason;* Big Mdws., Plumas Co., *R. H. Platt;* McCloud River, *M. S. Baker;* Martin Sprs., Eagle Lake, *Brown & Wieslander* 28; Happy Camp ranger sta., Warner Mts., *L. S. Smith* 1436; Davis Creek, ne. Modoc Co., *R. M. Austin.*

Refs.—HYPERICUM FORMOSUM H. B. K. Nov. Gen. & Sp. 5:196, t. 460 (1821), type loc. Pazcuaro, Mex., *Humboldt & Bonpland* (cf. Kew Bull. Misc. Inform. 1924:25). Var. SCOULERI Coulter, Bot. Gaz. 11:108 (1886). *H. scouleri* Hook. Fl. Bor. Am. 1:111 (1838), type loc. Northwest Coast near the Columbia River, *Scouler, Douglas;* Jepson, Fl. W. Mid. Cal. 235 (1901), ed. 2, 263 (1911), Man. 638 (1925).

5. **H. concinnum** Benth. GOLD-WIRE. (Fig. 243.) Stems wiry, numerous from the woody crown, forming a bushy plant 6 to 11 inches high; leaf-blades thickish, linear to lanceolate, acute, inserted by a narrow base, usually folded, scantily black-dotted, 3/4 to 1 3/4 inches long; flowers 7/8 to 1 1/8 inches broad, in rather close clusters at summit of the stem; sepals ovate, somewhat abruptly short-pointed; petals obovate, black-dotted on the margin; stamens numerous, 4 of the filaments in each of the 3 clusters distinctly united at base, the others free.

Dry brushy mountain slopes and ridges, 500 to 3000 feet: North Coast Ranges from Marin Co. to Mendocino Co.; Sierra Nevada foothills from Mariposa Co. to Shasta Co. June-July.

Locs.—North Coast Ranges: Mt. Tamalpais, *Jepson;* Weldon Cañon, Vaca Mts., *Jepson* 7193; Howell Mt. foothills, *Jepson* 2433 (petals in full anthesis reflexed); Knoxville, Napa Co., *Jepson;* Sonoma Geysers, *Brewer* 3948; Miyakma Range (e. of Ukiah), *Jepson* 3015; Potter Valley, Mendocino Co., *Holman.* Sierra Nevada: Greeley Hill near Coulterville, *H. M. Evans;* Columbia, Tuolumne Co., *Jepson* 6420; Angels Camp, *Alice King;* Wallace, w. Calaveras Co., *Jepson* 10,035; New York Falls, Amador Co., *Hansen* 32; Ione, *Braunton* 1003; Blue Cañon, Placer Co., *H. A. Walker* 1285; Brush Creek, Butte Co., *Conger;* Lamoine, Shasta Co., *Blankinship.*

Refs.—HYPERICUM CONCINNUM Benth. Pl. Hartw. 300 (1848), type *Hartweg* 394, type loc. given as "Sacramento Valley", but probably collected in the northern Sierra Nevada foothills in Nevada Co. (cf. Erythea 5:55); Jepson, Fl. W. Mid. Cal. 235 (1901), ed. 2, 263 (1911), Man. 638, fig. 631 (1925).

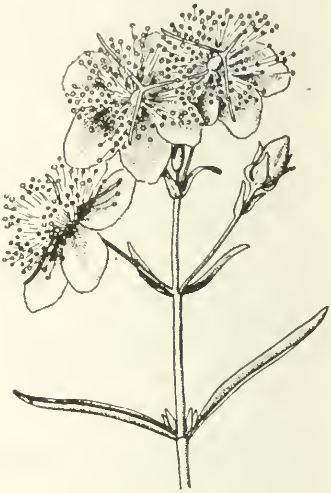

Fig. 243. HYPERICUM CONCINNUM Benth., fl. branchlet, × 1.

ELATINACEAE. WATER-WORT FAMILY

Small annuals with opposite leaves and membranous stipules between them. Flowers 2 to 5-merous, small, perfect, symmetrical, solitary in the axils. Sepals, petals and stamens all distinct and hypogynous. Ovary with as many cells as there are sepals; styles distinct. Capsule 2 to 5-celled, septicidal or the partitions more or less persisting with the axis; placentae central.—Genera 2 and species 30, all continents.

Bibliog.—Seubert, M., Elatinarum monographia (Nov. Act. Nat. Cur. 21^1:33–60, tt. 2–5,—1845). Gray, A., Elatines americanae (Proc. Am. Acad. 13:361–364,—1878).

Flower-parts 2 to 4; sepals obtuse, without midrib..........1. ELATINE.
Flower-parts 5; sepals pointed or acute, with thickened midrib and scarious margins....2. BERGIA.

1. ELATINE L. WATER-WORT

Glabrous dwarfs, somewhat succulent, growing in water or in wet places, rooting at the nodes. Leaf-blades entire. Flowers 2 to 4-merous. Sepals submembranous, obtuse. Petals white or whitish. Capsule globose, thin-membranous, 2 to 4-celled, several- or many-seeded. Seeds striately and regularly reticulated.—Species 10, all continents. (Greek, etymology obscure.)

Flowers sessile; flower-parts 3 or 2; seeds straight or nearly so.
  Flower-parts mostly 2; petals equal..........1. *E. americana.*
  Flower-parts mostly 3; petals unequal..........2. *E. brachysperma.*
Flowers pediceled; flower-parts 4; seeds strongly curved..........3. *E. californica.*

1. **E. americana** Arn. American Water-wort. Stems ¾ to 1½ inches long, often fistulous; leaf-blades obovate, 1 to 3 lines long; flowers mostly 2-merous; capsule valvate-dehiscent; seed with 9 or 10 rows of areoles, 20 to 30 areoles in a row.

Wet soil or shallow water, 5000 to 7000 feet: San Bernardino Mts.; Tuolumne Co. Exceedingly rare in California. North to British Columbia, east to Quebec. June-July.

Locs.—San Bernardino Mts. (Pl. World 20:222); Salt Log Mdw., Mather, Tuolumne Co., *Mason* 608.

Refs.—Elatine americana Arn. Edinb. Jour. Sci. 1:430 (1830); Jepson, Man. 639 (1925). *Peplis americana* Pursh, Fl. 238 (1814), type loc. Penn.

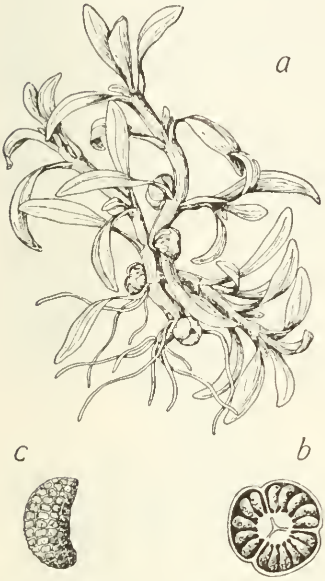

Fig. 244. Elatine brachysperma Gray. *a*, habit, × 3; *b*, cross sect. of ovary, × 9; *c*, seed, × 30.

2. **E. brachysperma** Gray. Yerba Fango. (Fig. 244.) Plants forming little mats (2 to 3 inches across); leaf-blades oblong or narrowly ovate, narrowed at base, 1 to 2 lines long; flowers sessile, mostly 3-merous; sepals commonly 3 (or 2), unequal; petals 3, pink, roundish-obovate, commonly unequal; stamens 3 to 6; capsule valvate-dehiscent or bursting irregularly; seed with about 8 longitudinal rows of areoles, about 11 or 12 areoles in a row.

Wet places, late vernal beds of winter pools, or lake borders, 25 to 5600 feet: Coast Ranges and southward to Southern California, mostly toward the coast, occasional. May.

Locs.—Walnut Creek, *Jepson* 13,954; Mountain Lake, San Francisco, *Jepson* 13,447; Lake Pilarcitos, San Mateo Co., *Davy* 5d; Crystal Lake, San Gabriel Mts., *Peirson* 2470; Ramona, *T. Brandegee* (capsules 3 or 4-valvate); La Jolla, *Jepson* 11,899.

Refs.—Elatine brachysperma Gray, Proc. Am. Acad. 13:361 (1878), based on spms. from Tex. and Ill. (*E. Hall*) and Cal. (*Kellogg & Harford*); Jepson, Fl. W. Mid. Cal. 234 (1901), ed. 2, 264 (1911), Man. 639 (1925). *Alsinastrum brachyspermum* Greene, Man. Reg. S. F. Bay 62 (1894).

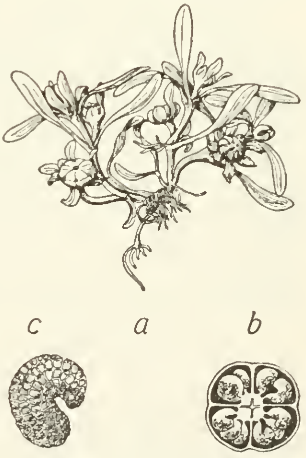

Fig. 245. Elatine californica Gray. *a*, habit, × 3; *b*, cross sect. of ovary, × 10; *c*, seed, × 25.

3. **E. californica** Gray. Yerba Estera. (Fig. 245.) Thickly branched, forming a dense mat ½ to 1½ inches across; leaf-blades obovate or oblanceolate, the lower ones petioled; flowers on short pedicels; sepals 4, oblong, equal; petals 4, obovate, equal; stamens 8; seeds curved into a partial ring, with about 10 longitudinal rows of areoles and about 25 areoles in each row.

Water borders, 5 to 5000 feet: little known but widely scattered in cismontane California. North to Washington. June-July.

Locs.—Cuyamaca, *T. Brandegee;* Laguna Cañon, Orange Co. (Bull. S. Cal. Acad. 17:65); Menifee Valley (Riverside Co.), (Bull. S. Cal. Acad. 22:9); Hemet Valley (Riverside Co.), *Munz* 5520; Kenworthy, San Jacinto Mts., *Munz* 5460; Sierra Valley.

Refs.—Elatine californica Gray, Proc. Am. Acad. 13:361 (1878), type loc. Sierra Valley, *Lemmon;* Jepson, Fl. W. Mid. Cal. 234 (1901), ed. 2, 264 (1911), Man. 639 (1925).

2. BERGIA L.

Stems glandular-pubescent. Flowers pediceled and often fascicled, 5-merous. Sepals abruptly cuspidate, with strong midrib and scarious margins. Petals oblong. Capsule globose, with a coriaceous wall.—Species 20, tropical and subtropical, all continents save Europe. (Dr. P. J. Bergius, Swedish naturalist of the 18th century.)

1. **B. texana** Seub. Stems diffusely branched, 6 to 12 inches high; leaf-blades obovate or oblanceolate, tapering at base, serrulate at apex, ½ to 1¼ inches long; sepals 2 lines long, denticulate on the midrib and serrulate on the margin towards the apex, equaling or exceeding the whitish obovoid petals; stamens 5 or 10.

Sandy soil, 5 to 1500 feet: Sacramento and San Joaquin valleys; coastal Southern California. Rarely seen with us. East to Texas and Missouri.

Locs.—Sutter Co., *Copeland* 3502; Sacramento (Bot. Cal. 1:80); Merced (Fl. Fr. 114); Visalia, *Congdon;* Los Angeles, *T. W. Minthorn* 8; Elsinore, *Parish.*

Refs.—BERGIA TEXANA Seub.; Walp. Rep. 1:285 (1842); Jepson, Fl. W. Mid. Cal. 234 (1901), ed. 2, 264 (1911), Man. 639 (1925). *Merimea texana* Hook. Ic. Pl. t. 278 (1840), type from Texas, *Drummond. Elatine texana* T. & G. Fl. 1:678 (1840).

FRANKENIACEAE. FRANKENIA FAMILY

Low perennial herbs or dwarf bushes. Leaves opposite, entire, the opposite pairs joined at base by a narrow ciliated margin or border. Flowers perfect. Ovary superior, 1-celled, with parietal placentae. Seeds with a straight embryo.—Genera 4, species 34, all continents.

1. FRANKENIA L.

Leaves small, crowded and fascicled in the axils. Flowers sessile, solitary, or by the reduction of the upper leaves to bracts becoming somewhat cymose. Calyx tubular, furrowed or almost prismatic, 4 or 5-toothed. Petals 4 or 5, appendaged at the very base of the limb, the appendage decurrent on the claw. Stamens in ours 4 to 7, hypogynous, exserted from the calyx-tube. Style 2 or 3-cleft, included. Capsule linear, angled, included in the persistent calyx, 2 to 4-valved, the seeds attached by filiform funiculi to the side of the cell.—Species 31, all continents. (Johann Franke, 1590–1661, Professor at Upsala, the first author who treated of Swedish plants.)

Style 3-cleft; ovules many; herbaceous or nearly so; common..................1. *F. grandifolia.*
Style 2-cleft; ovules 2 or 3; dwarf bush; San Diego..................2. *F. palmeri.*

1. **F. grandifolia** C. & S. ALKALI-HEATH. Erect or diffuse, often slightly woody at base, 6 to 13 inches high, glabrous or somewhat pubescent or short-hirsute, particularly at the nodes; leaf-blades obovate to linear-oblanceolate, 3 to 5 lines long, with revolute margins, sessile or short-petiolate; calyx 3 lines long, narrow-cylindrical, with acute teeth; petals slightly irregular, pinkish, exserted 1¼ to 2 lines, with oblong or obovate blade erose at summit; stamens 4 to 7; seeds numerous.

Sea shores and salt marshes, 5 to 100 feet: Marin Co. to San Diego. South to Lower California. June-Oct.

Locs.—Pt. Reyes, *Jepson;* West Berkeley, *Davy;* Bay Farm Isl., Alameda, *Jepson* 9809a; Pt. Pinos, Monterey, *Heller* 8407; Goleta, Santa Barbara Co., *Parish* 11,054; Santa Cruz Isl., *Olive Thacher;* Oxnard, *Davy* 7793; Nigger Slough, Los Angeles coast, *Braunton* 497; Long Beach, *W. F. Parish;* Oceanside, *Parish* 4443; Coronado, San Diego Co., *Chandler* 5186.

Var. campestris Gray. Tufted, 4 to 20 inches high; leaf-blades mostly linear-spatulate to oblanceolate, strongly revolute-margined, 2 to 4 lines long; petals less exserted (¾ to 1 line).—Interior alkaline plains, 5 to 1500 feet: Great Valley, South Coast Ranges, eastward to Inyo Co. and southward to Southern California. Also southern Nevada (Contrib. U. S. Nat. Herb. 25:358).

Locs.—Willows, *Jepson;* Norman, Glenn Co., *Davy;* Vacaville, *Jepson;* Balsa, e. of Gilroy, *Jepson* 6207; Soap Lake, Hollister, *Jepson;* Bakersfield, *Davy* 1920; Panamint Lake, *Parish* 10,113; Saratoga Sprs., Death Valley, *Parish* 10,024; San Jacinto Lake, *Jepson* 1239; Elsinore, *Parish* 4396.

Refs.—Frankenia grandifolia C. & S. Linnaea 1:35 (1826), type loc. San Francisco, *Chamisso;* Torr. Bot. Mex. Bound. 36, pl. 5 (1859); Jepson, Fl. W. Mid. Cal. 163 (1901) and ed. 2, 264 (1911) in part, Man. 640, fig. 632 (1925). *Velezia latifolia* Esch. Mem. Acad. Sci. St. Petersb. 10:285 (1826), type from Cal., *Eschscholtz.* Var. campestris Gray, Syn. Fl. 1^1:208 (1895), type loc. San Jacinto, *Parish;* Jepson, Man. l.c.

2. **F. palmeri** Wats. Yerba Reuma. (Fig. 246.) Dwarf spreading bush 5 to 7 inches high, the branchlets thickly clothed with leaves; leaf-blades linear-oblong, thick and strongly revolute so as to be nearly terete, canescent, 1 to 2 (or 2½) lines long; calyx 1½ lines long; petals whitish, the limb oblong; stamens 4.

Borders of salt marshes, 1 to 100 feet: coast at San Diego and south into Lower California. June-July.

Note on the leaves.—The leaves of the opposite pairs in Frankenia grandifolia are joined at base by a narrow membrane which is slightly hairy on the margin. The petioles therefore arise from a shortly sheathing base. In Frankenia palmeri, on the contrary, distinct stipules are present. The stipules are short, broad and ciliated, each pair being connected with the stipules of the opposite leaf by a narrow border.

Refs.—Frankenia palmeri Wats. Proc. Am. Acad. 11:124 (1876), type loc. Lower California on the gulf side, *Palmer;* Jepson, Man. 640 (1925).

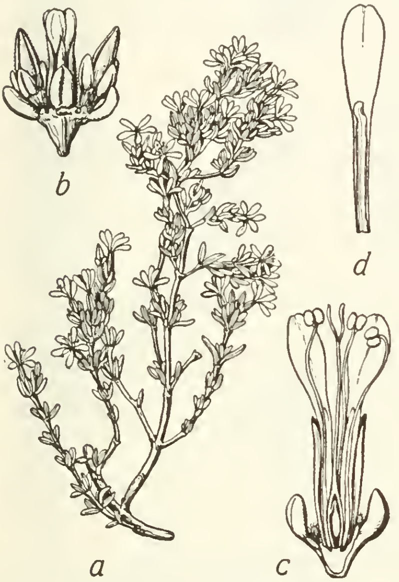

Fig. 246. Frankenia palmeri Wats. *a,* flowering branch, × 1; *b,* involucre with flowers, × 4; *c,* long. sect. of fl., × 5; *d,* petal, × 5.

TAMARICACEAE. Tamarisk Family

Shrubs or low trees, inhabitants of alkaline soils, with long slender branches bearing numerous minute appressed leaves. Flowers minute, numerous, in long clusters at the ends of the branches. Sepals 4 or 5. Petals 4 or 5, these and stamens (as many or twice as many) borne on a fleshy disk. Ovary superior, 1-celled, the placenta basal; styles 3 to 5. Fruit a capsule; seeds numerous, usually with a tuft of hairs at one end.—Genera 4, species 90, Asia, Africa and Europe.

1. TAMARIX L. Tamarisk

Our only genus.—Species 64, Europe, Asia and Africa. (Tamaris, a river in Spain.)

1. **T. gallica** L. French Tamarisk. Densely branched shrub 3 to 8 feet high and often twice as broad; leaves ½ to ¾ line long; flowers 5-merous.

Cultivated from Europe, an escape along the beds of winter flood channels, 25 to 3700 feet: cismontane and desert valleys. Mar.-May.

Locs.—Sulphur Creek, Wilbur Sprs., sw. Colusa Co., *Jepson* 9030; Sweeney Creek near Binghamton, *Jepson* 12,399; White Sulphur Creek, Napa Valley, *Jepson* 9832; Warm Sprs., Alameda Co., *R. E. Smith;* Cache Creek, Tehachapi Pass, *Jepson;* Furnace Creek, Death Valley, *Jepson;* Chino, Riverside and Wilmington (Bull. S. Cal. Acad. 17:66).

Refs.—Tamarix gallica L. Sp. Pl. 270 (1753), "Gallia, Hispania, Italia"; Jepson, Man. 640 (1925).

FOUQUIERIACEAE. Candlewood Family

Heavily armed shrubs, leafless in the drought periods between the rains. Primary leaves of the season's shoots soon deciduous but developing their petioles into stout spines, the ordinary leaves borne on short spurs in the axils of the spines. Flowers showy, perfect, in terminal panicles. Sepals 5, unequal, imbricated. Corolla tubular, shortly 5-lobed. Stamens 10 to 17; filaments with a firm or red portion at base, this portion puberulent on back and developed at apex into a tooth or short ligule on the inside. Ovary superior; placentae parietal, lamellate, intruded in cavity and partly united at base so as to make an incompletely 3-celled ovary; ovules 4 to 6 on each placenta; styles 3, united to the middle. Fruit a capsule.—Genus 1.

Bibliog.—Niedenzu, F., Fouquierioideae in Engler & Prantl, Nat. Pflzfam. 3^6:298, fig. 136 (1893). Nash, Geo. V., Revision of the family Fouquieriaceae (Bull. Torr. Club 30:449–459,—1903). Robinson, W. J., The spines of Fouquieria (Bull. Torr. Club 31:45–50, figs. 1–13,—1904). Cannon, W. A., Transpiration of Fouquieria splendens (Bull. Torr. Club 32:397–414, figs. 1–7,—1905). Humphrey, R. H., Thorn formation in Fouquieria splendens (Bull. Torr. Club 58:263–264,—1931). Scott, Flora M., Some features of the anatomy of Fouquieria splendens (Am. Jour. Bot. 19:673–678, figs. 1–7,—1932).

1. FOUQUIERIA HBK. Coach-whip

The only genus.—Species 3, Mexico and southwestern United States. (P. E. Fouquier, professor of medicine at Paris.)

1. **F. splendens** Engelm. Ocotillo. (Fig. 247.) Stems mostly simple, 8 to 25 feet high, in clusters from a common root-crown; bark whitish, deeply furrowed between the decurrent bases of the slender but rigid spreading spines; leaf-blades fleshy, obovate, rounded at apex, contracted to a narrow base, sessile, 5 to 10 lines long, forming axillary rosettes on old wood; panicles racemose, dense, 4 to 10 inches long; flowers scarlet, ¾ to 1 inch long; sepals roundish, 2 to 3 lines broad; corolla-lobes recurving; stamens 15 to 17, exserted; capsule 8 lines long, 3-valved; seeds with a long fringe of hairs.

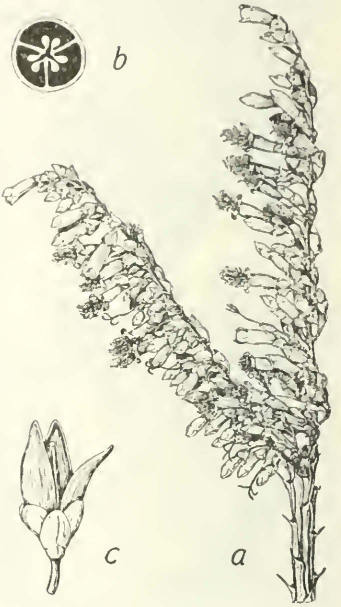

Fig. 247. Fouquieria splendens Engelm. *a*, inflorescence, × ⅓; *b*, cross sect. of ovary, × 5; *c*, fr., × 1.

Desert mesas, 5 to 1700 feet: Colorado Desert. East to Texas, south to Mexico. Apr.-June.

Field note.—On the rocky-gravelly mesa in the upper part of the Vallecito, eastern San Diego Co., Fouquieria splendens makes a thin pygmy forest about 2½ miles long by 2 miles wide, a stand which exerts a sense of strange uniqueness on the mind of the traveler entering the area over the rocky traverse that closes the lower end of Mason Valley. The clumps or vase-like clusters, spaced 35 to 50 feet apart on the average, consist of half-a-dozen to as many as 50 or even 100 stems. After a rain, these stems, which are mostly simple, are clothed from top to bottom with small green rosettes of leaves. In this locality the heights of three individuals were measured as follows: 21 feet, 2 inches; 22 feet; and 25 feet, 2 inches. The latter individual had a circumference of 16 inches at the ground. This species may flower two or three times in one year during periods of favorable moisture. While the shrubs become leafless during drought periods, they respond quickly to slight rainfall; and even the limits of marked thunderstorms in the desert can sometimes be traced by the prompt leafage of the Ocotillo. It is also called Holy Candle and Our Lord's Candle on account of the panicles (4 to 10 inches long) which make tongues of a flame-like color borne at the summit of the very spiny stems.

Locs.—Calexico, *Davy* 8010; Mountain Sprs., e. San Diego Co., *Parish* 9068; Vallecito, *Jepson* 8621; Sentenac Valley, e. San Diego Co., *Jepson;* Borrego Valley, *Jepson;* Coachella, *Greata;* Cottonwood Spr., n. of Mecca, acc. *Peirson;* Black Point, Riverside Mts., *Jepson* 5251.

Refs.—Fouquieria splendens Engelm.; Wisliz. Mem. Tour n. Mex. 98 (1848), type loc. Jornado del Muerto, N. Mex., *Wislizenius;* Jepson, Man. 641, fig. 633 (1925).

CISTACEAE. Rock-rose Family

Low shrubs but ours herb-like or woody only at base. Flowers complete, regular, hypogynous. Sepals 5, persistent (2 smaller, wholly on the outside and bract-like). Petals 5, ephemeral. Stamens indefinite. Ovary superior, 1-celled with 3 parietal placentae; style one; ovules orthotropous on slender funiculi. Capsule 3-valved.—Genera 4, species 153, mostly north temperate (especially Mediterranean) but all continents save Australia.

Bibliog.—Gray, A., Cistaceae in Syn. Fl. 1^1:189–194,—1895. Grosser, W., Cistaceae in Engler, Pflzr. 4^{193}:1–161, figs. 1–22,—1903.

1. HELIANTHEMUM Mill.

Leaves alternate, their blades simple, entire. Flowers yellow, opening but once. Stamens usually numerous, with filiform filaments and short anthers. Style very short or none; stigma capitate, 3-lobed. Capsule 1-celled or nearly 3-celled by the intrusion of the placentae.—Species about 120, North and South America but mostly Mediterranean. (Greek helios, sun, and anthemon, blossom.)

Flowers in a panicle or raceme; herbage pubescent or glabrate..............1. *H. scoparium.*
Flowers corymbose; herbage woolly; Santa Cruz Isl..............2. *H. greenei.*

1. **H. scoparium** Nutt. Rush-Rose. Stems numerous, tufted, erect, very leafy, 8 to 20 inches high, arising from a much-branched woody crown and ending above in a small leafy panicle or short raceme; herbage and calyx minutely stellate-pubescent or glabrate; leaf-blades narrowly linear, ½ to 1¼ inches long, early deciduous; inner sepals 2 to 3 lines long, the two outer minute; corolla 5 to 7 lines broad; petals obovate; stamens 8 to 24; placentae partition-like; embryo slender and much coiled.

Sandy flats or beaches, 5 to 100 feet: along the middle California coast from Mendocino Co. to Santa Barbara Co. Apr.-May.

Locs.—Ft. Bragg, *W. C. Mathews;* Monterey, *Jepson* 5703, 9773; Surf, *K. Brandegee.* This coastal state passes into the prevailing form, the next variety.

Var. **vulgare** Jepson. Stems rush-like, the leaves sparse or deciduous; herbage pubescent or glabrate, rarely canescent; calyx usually smaller; raceme or panicle naked.—Dry sunny slopes and ridges of the chaparral belt, 300 to 4000 feet: Coast Ranges from Lake Co. to San Luis Obispo Co.; Sierra Nevada from Eldorado Co. to Mariposa Co.; Santa Barbara Co. to San Diego Co. South to Lower California.

Locs.—Coast Ranges: Lake Co.; Mt. Tamalpais, *Jepson;* Moraga Pass, Oakland Hills, *Davy;* Los Gatos, *Heller* 7350; Santa Lucia Mts., *Vortriede;* Arroyo Grande, *Alice King.* Sierra Nevada: Sweetwater Creek, Eldorado Co., *K. Brandegee;* Burson, Calaveras Co., *Jepson* 9955; betw. Colfax Sprs. and Crockers sta., Yosemite road, *H. M. Evans;* Coulterville, Mariposa Co. S. Cal.: Pelican Bay, Santa Cruz Isl., *Jepson* 12,093; San Marcos Pass, Santa Inez Mts., *Jepson* 12,138; Santa Susanna Pass, *Jepson* 8469; Glendora, *E. D. Palmer;* Mt. Lowe foothills, *Peirson* 115; Waterman Cañon, San Bernardino Mts., *Jepson* 5558; Jurupa Hills, Riverside, *C. M. Wilder;* Ramona, *K. Brandegee;* San Felipe, *Parish* 290; San Diego, *Mary Spencer* 74.

Field note.—Well developed plants grow on the low hills about Burson in Calaveras Co. The very bushy individuals vary from 1 to 4 feet broad and 14 to 20 inches high. These plants are very floriferous, the larger individuals bearing over 200,000 flowers and buds.

Var. **aldersonii** Munz. Inflorescence extremely open; petals fan-shaped, 4 lines long.—San Diego Co.: Dulzura, *Abrams* 3749; Ramona, *K. Brandegee;* e. of San Diego, *Mary Spencer* 73.

Refs.—Helianthemum scoparium Nutt.; T. & G. Fl. 1:152 (1838), type loc. Monterey, *Nuttall;* Jepson, Fl. W. Mid. Cal. 233 (1901), ed. 2, 265 (1911), Man. 641, fig. 634 (1925). *Halimium scoparium* Gross.; Engler, Pflzr. 4^{193}:35, fig. 9A-D (1903). *Crocanthemum scoparium* Millsp. Field Mus. Nat. Hist. Bot. 5:175 (1923). *Helianthemum mendocinensis* Eastw.; Engler, Pflzr. 4^{193}:35 (1903), as synonym. Var. vulgare Jepson, Man. 641 (1925), type loc. Coulterville, *Jepson* 13,953. Var. aldersonii Munz, Man. S. Cal. Bot. 316 (1935). *Helianthemum aldersonii* Greene, Erythea 1:259 (1893), type loc. San Diego Co., *Alderson* (probably near Witch Creek).

2. **H. greenei** Rob. Stems from a woody base, branching, 6 to 10 inches high; young parts white-woolly; leaf-blades linear, 1 to 1¼ lines broad; flowers on short (1 to 2 lines) pedicels in a somewhat condensed corymbose panicle; outer sepals linear or lanceolate, ½ to as long as the ovate acuminate inner ones.

Dry slopes, 1500 to 2500 feet: Santa Cruz Isl.; San Diego Co. Apr.

Locs.—In its typical form Helianthemum greenei occurs only on Santa Cruz Island, but a closely related state is found on the San Diego coast (La Jolla, *Jepson* 11,841a).

Refs.—HELIANTHEMUM GREENEI Rob.; Gray, Syn. Fl. 1^1:191 (1895). *H. occidentale* Greene, Bull. Cal. Acad. 2:144 (1886), type loc. Santa Cruz Isl. (central high part), *Greene;* not H. occidentale Nyman (1878). *Halimium occidentale* Grosser; Engler, Pflzr. 4^{193}:35 (1903).

RESEDACEAE. Mignonette Family

Herbs with simple alternate leaves. Flowers perfect, irregular, in racemes or spikes, ours inconspicuous. Sepals 4 to 7. Petals 2 to 6. Stamens 3 to 40, always more numerous than the petals, borne on one side of the flower. Pistil superior, 1-celled, with parietal placentae, opening at the top before the seeds are full-grown. Stigmas 2 to 6, sessile, minute.—Genera 6, species about 66, North America, Europe, Asia and Africa.

1. OLIGOMERIS Cambess.

Low branching somewhat succulent herb. Leaves with linear entire blades. Flowers white, in terminal spikes. Sepals 4. Petals (2) and stamens (in ours 3) inserted on the upper side of the flower. Capsule depressed, 4-lobed (each lobe sulcate on the back), opening at the summit.—Species 5, North America, Asia and Africa. (Greek oligos, little, and meris, parts.)

1. **O. linifolia** Mcbr. Erect annual, branching from the base, ¾ to 2 feet high; leaf-blades ½ to 1⅜ inches long; flowers 1 line long; petals oblong, acute; capsules 1½ lines broad.

Sandy mesas and flats, 5 to 2000 feet: cismontane Southern California; Colorado Desert; eastern Mohave Desert. East to southern Nevada and Texas, south to Mexico. Asia and Africa. Mar.-Apr.

Locs.—Cismontane S. Cal.: Santa Catalina Isl., *T. Brandegee;* Santa Monica, *Geo. B. Grant* 869; Newport Bay, *L. M. Booth* 1097; Menifee, Riverside Co., *Alice King;* San Diego, *Jepson* 1598. Colorado Desert: Twenty-nine Palms, *Jepson* 12,633; Palo Verde, *Schellenger;* Painted Cañon, n. of Mecca, *Jepson* 11,670; Mecca, *Parish* 8481; Coachella, *Schellenger;* Indio, *Jepson* 6059; Borrego Valley, *Jepson* 8796; Vallecito, *Jepson* 8558; Superstition Mt., *Parish* 9031; Cameron Lake, *T. Brandegee;* Calexico, *Davy* 8013. Mohave Desert: Yermo, *Jepson* 15,858; Bagdad, *Hall* 6082. Nevada: Searchlight (15 mi. e.), *Parish* 10,291.

Refs.—OLIGOMERIS LINIFOLIA Mcbr. Contrib. Gray Herb. 53:13 (1918); Jepson, Man. 642 (1925). *Reseda linifolia* Vahl; Hornem. Hort. Hafn. 501 (1815), type loc. s. Eur. *O. subulata* Webb, Fragm. Aethiop. 26 (1854); Parish, Zoe 1:301 (1890). *O. glaucescens* Camb.; Jacquemont, Voy. Ind. 4:24, t. 25 (1838).

Reseda L. Mignonette. Annual herbs; flowers in racemes; sepals 4 to 8; petals 4 to 7, laciniate; stamens 8 to 40, inserted on a disk on one side of the flower; capsule 3 to 6-lobed, horned. 1. R. ODORATA L. Sys. Nat. ed. 10, 1046 (1759), type from North Africa. Leaves mostly entire; petals yellowish-white, deeply 5 to 8-cleft.—Garden escape in Marin Co. 2. R. LUTEA L. Sp. Pl. 449 (1753), type from Europe. Leaves divided; petals greenish-yellow, all cleft but 1 or 2.—Garden escape about Los Angeles. 3. R. ALBA L. Sp. Pl. 449 (1753), type from Europe. Leaves pinnatifid; petals white, all 3-cleft at summit.—Occasional garden escape.

VIOLACEAE. Violet Family

Perennial herbs with alternate stipulate leaves and complete flowers. Sepals 5, persistent. Corolla irregular, consisting of 5 somewhat unequal petals, 2 upper, 2 lateral and 1 lower, the lower spurred at base. Stamens 5, with short and broad filaments bearing the anthers on their inner face and connivent over the ovary.

Ovary superior, 1-celled, maturing into a 3-valved capsule with valves placenta-bearing along the middle. Style and stigma one. Seeds rather large, with a hard coat and straight embryo in fleshy endosperm.—About 15 genera and 400 species; all continents.

1. **VIOLA** L. VIOLET

Peduncles axillary, 1-flowered. Stipules persistent. Sepals unequal, produced below the point of insertion into auricles, persistent. Stamens with broad connectives which are prolonged beyond the anthers, the two lower bearing wings which project into the spur of the corolla. The valves of the capsule bear the seeds along the middle, and after dehiscence fold together firmly lengthwise and eject the seeds with violence.—Species 300, all continents, chiefly north temperate. (Old Latin name used by Virgil.)

Geog. note.—In California Viola is best-developed in the moister northern regions,—in wet meadows, marshes or bogs or in pine woods or in the Redwood belt. Southward the genus becomes progressively less common, both as to species and individuals—in the Sierra Nevada, inner South Coast Range and Southern California. Only two species are characteristic tropophytes of the low foothills; they develop during the winter and spring rains and flower in March and April. During the succeeding late spring, summer and early fall period, arid and rainless, their above-ground organs perish and the plants hibernate by means of the deeply-seated rootstocks until the advent of another growing season. These two species are Viola pedunculata and Viola douglasii. While Viola douglasii is very widely dispersed at low altitudes in cismontane California, mostly in open ground, it keeps in the main to the interior and overlaps only somewhat narrowly the territory of Viola pedunculata which, a strictly open-ground and abundant species, is more nearly coastal in its distribution.

Bibliog.—Gray, A., Memoranda of a revision of the N. Am. violets (Bot. Gaz. 11:253–256, 289–293,—1886). Greene, E. L., Remarks on acaulescent violets (Pitt. 3:139–145,—1896); New or noteworthy violets (Pitt. 3:313–318,—1898); A fascicle of new violets (Pitt. 4:3–9,—1899); Some neglected violets (Pitt. 4:285–297,—1901); Some new acaulescent violets (Pitt. 5:29–33,—1902); New species of Viola (Lflts. 1:214–219,—1906); A fascicle of violets (Lflts. 2:94–98,—1910). Brainerd, Ezra, Violets of N. Am. (Vt. Agr. Exp. Sta. Bull. 224:1–172,—1921); Some natural violet hybrids of N. Am. (l.c. 239:3–205,—1924). Newsom, V. M., Violets of S. Cal. (Bull. S. Cal. Acad. 23^4:1–6,—1924). Clausen, J., Chromosome number and relationship of some N. Am. species of Viola (Ann. Bot. 43:741–764, figs. 1–59,—1929). Baker, M. S., A revision of the Pacific Coast species of Viola, ms. (1933).

A. Leaf-blades divided or parted (merely toothed in one var. of no. 5).

- Upper petals deep blue or purple; lateral petals with a bearded spot.
  - Leaves puberulent (sometimes glabrous); lateral and lower petals bluish or white with yellowish base.......1. *V. beckwithii.*
  - Leaves glabrous; lateral and lower petals yellow or cream-color.......2. *V. hallii.*
- Petals all yellow or purplish or brownish externally or purple-veined; lateral petals with or without beard.
  - Leaves pinnately twice-parted into narrow segments; petals orange-yellow, the 3 lower purple-veined, the others brownish externally.......3. *V. douglasii.*
  - Leaves palmately cleft or divided.
    - Stems mostly below ground, the peduncles mostly basal or scape-like; petals pale yellow.......4. *V. sheltonii.*
    - Stems 4 to 14 inches high, naked below the leafy summit which bears the axillary peduncles; petals yellow, purple externally.......5. *V. lobata.*

B. Leaf-blades undivided.

- Flowers yellow (blue or purple in one var. of no. 7).
  - Stems prostrate, stolon-like; leaf-blades round-cordate, rounded at apex; Redwood belt.......6. *V. sempervirens.*
  - Stems erect.
    - Leaves mostly elongate.
      - Peduncles usually surpassing the leaves; capsule puberulent; leaves commonly dentate, mostly ¾ to 1¼ inches long.......7. *V. purpurea.*
      - Peduncles usually not surpassing the leaves; capsule glabrous; leaves entire or subentire, mostly 1 to 2 inches long.......8. *V. nuttallii.*
    - Leaves not elongate.
      - Peduncles 1½ inches long; corolla bright yellow, more or less purple-veined; leaf-blades thin; wet woods.......9. *V. glabella.*
      - Peduncles 4 to 5 inches long; corolla golden yellow with brown-purple lines at base; leaf-blades thickish; open hills.......10. *V. pedunculata.*

Flowers not yellow (or with some other color predominating).

Peduncles borne on erect leafy stems which arise from short or creeping rootstocks; (stems in no. 13 at first very short).

Lateral petals with a purple spot or blotch at base; stems mostly naked below, leafy above, 3 to 12 inches high; stipules entire.

Leaf-blades mostly cordate at base; stipules membranous....................11. *V. ocellata.*

Leaf-blades mostly truncatish or subcuneate at base; stipules submembranous.......... 12. *V. cuneata.*

Petals not spotted, blue or violet, rarely white; stems (at least at first) very short (mostly ½ to 1 inch long) or almost none; stipules herbaceous, lacerate or toothed; common..13. *V. adunca.*

Peduncles scape-like, these and the leaves arising directly from rootstocks or stolons; herbage glabrous.

Leaf-blades cordate.

Petals blue, violet or whitish; leaf-blades commonly 1 to 2 inches wide; rare species in Cal.

Rootstocks thick and rather short, creeping underground, never sending off runners or stolons; lower petals hairy at base, the others more or less so; montane, infrequent..14. *V. nephrophylla.*

Rootstock filiform; petals pale violet or whitish, the lateral ones with a sparsely bearded spot or beardless; north coast............15. *V. palustris.*

Petals white, commonly beardless; rootstock filiform; leaf-blades ½ to 1 inch wide; montane, common...16. *V. blanda.*

Leaf-blades narrow-ovate to rhomboid-elliptic, not cordate; rootstock thickish; petals white, the lateral with a bearded spot; Del Norte Co., rare....17. *V. occidentalis.*

1. **V. beckwithii** T. & G. Sagebrush Pansy. Plants 2 to 4 inches high, the cluster of slender stems mainly below ground, arising from a short and usually deep rootstock; herbage puberulent or sometimes nearly glabrous; leaf-blades palmately about 3 times 3-parted into linear or spatulate-linear segments, the segments mostly obtuse or sometimes mucronulate; primary divisions more or less petiolulate; peduncles scape-like; petals 4 to 7 lines long, the upper deep purple, the others light cream or light blue and purple-veined, with a yellowish base; spur short-saccate; stigma beakless, with a tuft of spreading or reflexed bristles on each side.

Moist gravelly soil, 3000 to 5000 feet: east side or easterly valleys of the northern Sierra Nevada from Nevada Co. to Modoc and Siskiyou Cos. North to Oregon, east to Utah. Mar.-June.

Leaf variation.—In a broad way Viola beckwithii exhibits two leaf forms: the prevailing form has narrowly divided leaves, with the segments ⅓ to 1 line wide, the other form has oblong segments 1½ to 3 lines wide. There is no geographic segregation and the two forms freely intergrade.

Locs.—Prosser Creek flats near Hobart Mills, Nevada Co., *L. S. Smith* 1787; betw. Truckee and Donner Lake, *Sonne* 26; Sardine Valley, Nevada Co., *Sonne;* Antelope Valley, e. of Sierraville, *L. S. Smith* 1580; American Valley, Plumas Co., *R. M. Austin* 10; McArthur, Shasta Co., *Alma Ames;* Canby, Modoc Co., *L. S. Smith* 916; Goose Lake Valley, ne. Modoc Co., *Austin & Bruce* 2256; Ft. Bidwell, *Manning;* Forestdale, sw. Modoc Co., *M. S. Baker;* Edgewood, Siskiyou Co., *J. W. Kisling;* Yreka Hills, *Butler* 1124.

Refs.—Viola beckwithii T. & G. Pac. R. Rep. 2:119, pl. 1 (1855), type loc. betw. Great Salt Lake and the Sierra Nevada, *Snyder;* Jepson, Man. 643 (1925).

2. **V. hallii** Gray. Oregon Pansy. Plants 3 to 5 inches high; stems and basal leaves arising from a deeply-seated rootstock, the cauline leaves short-petioled; herbage glabrous; leaf-blades ovate or oblong and irregular in outline, subpinnately or palmately twice parted into lanceolate or linear segments and callous-apiculate at their tips, 1 to 1½ inches long, the petioles of the basal leaves nearly twice as long; peduncles 1¼ to 3¼ inches long; petals 3 to 6 lines long, strongly 2-colored, the upper deep blue or dark purple, the others light cream, purple-veined at base, the lateral with a bearded spot on claw; stigma beakless, bearded below its margin.

Moist gravelly soil, wooded slopes, 2500 to 6600 feet: Mendocino Co. to Trinity and Del Norte Cos. North to Oregon. May-July.

Locs.—Ukiah, *M. S. Baker;* Potter Valley, *Purpus* 904; Willits, *M. S. Baker;* South Yollo Bolly, *Jepson* 14,103; Larrabee Valley, Humboldt Co., *Tracy* 7034; Kneeland Prairie, Humboldt Co., *Tracy* 4046; Post Creek Mt., Trinity Co., *Tracy* 6480; Parker Creek, Salmon Mts., *Hall* 8645; Gasquet, Del Norte Co., *M. S. Baker.* Ore.: Grants Pass, *M. S. Baker.*

Refs.—VIOLA HALLII Gray, Proc. Am. Acad. 8:377 (1872), type loc. Salem, Ore., *E. Hall, Howell;* Jepson, Man. 643 (1925).

3. **V. douglasii** Steud. GOLD VIOLET. Plants 2 to 5 inches high, the cluster of stems wholly or almost completely underground, arising from a deep short rootstock; herbage pubescent, the stems and petioles subglabrous or glabrous; leaf-blades bipinnatifid with long linear or oblong segments; stipules lanceolate, entire or incised; flowers usually large, on peduncles (2 to 3 inches long) equaling or exceeding the leaves; petals 6 to 8 lines long, orange-yellow, the two upper brownish-purple externally, the others purple-veined; capsule 3 to 4 lines long, acute.

Grassy slopes or plains, mostly in open country, 100 to 6600 feet: cismontane Southern California; Tehachapi Mts.; Sierra Nevada foothills from Tulare Co. to Shasta Co.; Sacramento Valley; inner Coast Ranges from San Luis Obispo Co. to Siskiyou Co. North to Oregon. Mar.-May.

Locs.—S. Cal.: Laguna Mts., *Munz* 9658; Santa Ysabel, San Diego Co., *Jepson* 8525; Henshaw Dam, San Diego Co., *Jepson* 12,438; Bear Valley, San Bernardino Mts., *Munz* 5653; betw. Pine Flats and Chileo, San Gabriel Mts., *Peirson* 2447; Santa Barbara, *Parry & Lemmon.* Tehachapi Mts.: Tehachapi, *Munz* 8928. Sierra Nevada: Springville, Tulare Co., *Purpus* 5445; Big Sandy Creek, Fresno Co., acc. *M. S. Baker;* Mariposa, *Duncan Dunning;* Jamestown, Tuolumne Co. *A. L. Grant* 622; Ione, Amador Co., *K. Brandegee;* Auburn, *Shockley;* Penn Valley, Nevada Co., *Jepson* 14,106; Oroville (n. of), *Heller* 11,189; Burney Valley, Shasta Co., *M. S. Baker.* Sacramento Valley: Vacaville, *Jepson* 14,104; Elk Grove, Sacramento Co., *Drew;* Blacks, Yolo Co., *Nutting;* College City, Colusa Co., *Alice King;* Anderson, Shasta Co., *Alice King.* Middle and inner Coast Ranges: Paso Robles, *Betty Knight;* betw. Emmet and Panoche Pass, *Abrams & Borthwick* 7929; Mt. Hamilton, *C. F. Baker* 635; Santa Rosa, *M. S. Baker;* Middletown grade, Mt. St. Helena, *Jepson* 14,105; Kelseyville, Lake Co., *Chandler;* Round Valley, ne. Mendocino Co., *Westerman;* Elk Creek, w. Glenn Co., *Guy Smith;* Hayfork Mt., Trinity Co., *Tracy* 6447; Quartz Valley, Siskiyou Co., *Butler* 607.

Refs.—VIOLA DOUGLASII Steud. Nomencl. ed. 2, 771 (1841); Jepson Fl. W. Mid. Cal. 233 (1901), ed. 2, 267 (1911), Man. 643 (1925). *V. chrysantha* Hook. Ic. Pl. t. 49 (1836), type from Cal., *Douglas;* not V. chrysantha Schrader (1832). *V. pruinosa* Pollard, Proc. Biol. Soc. Wash. 13:130 (1900), type loc. "Bear Valley," *Leiberg* 3307, doubtless in the San Bernardino Mts. acc. Jos. A. Ewan; foliage densely short-pubescent, flowers smaller.

4. **V. sheltonii** Torr. FAN VIOLET. Plants 3 to 6 inches high, the stems mostly below ground, arising from a short rootstock; herbage glabrous; leaf-blades orbicular in outline, ¾ to 1¾ inches wide, palmately 3-divided, the cuneate-obovate divisions palmately 3-parted or again cleft into linear or oblong lobes, the lobes obtuse; peduncles scape-like; petals pale yellow, beardless, 4 to 6 lines long.

Wooded or chaparral slopes or rocky places, 2000 to 8000 feet: Santa Ana and San Gabriel mountains; Sierra Nevada from Tulare Co. to Modoc Co.; North Coast Ranges from Santa Clara Co. to Siskiyou Co. North to Washington. Apr.-July.

Locs.—S. Cal.: Santiago Peak, Orange Co., *Peirson* 3496; San Antonio Mts. (Bull. Torr. Club 49:353). Sierra Nevada: Monarch Lake trail, Tulare Co. (acc. *M. S. Baker*); Sherlocks, Mariposa Co., *Congdon;* Hetch-Hetchy, *Bioletti;* Sierra Valley, Sierra Co., *Parry & Lemmon;* Jameson Creek, Plumas Co., *Hall* 9353; Warner Mts., e. Modoc Co., *Lemmon.* North Coast Ranges: Snow Mt., n. Lake Co. (Zoe 4:171); Black Butte, w. Colusa Co., *Rattan;* South Fork Mt., Humboldt Co., *Tracy* 8910; Buck Mt., Humboldt Co., *Tracy* 4187; Marble Mt., Siskiyou Co., *Chandler* 1650; Yreka, *Butler* 1189.

Refs.—VIOLA SHELTONII Torr. Pac. R. Rep. 4:67, t. 2 (1857), type loc. Yuba River near Downieville, *Bigelow;* Jepson, Man. 644 (1925).

5. **V. lobata** Benth. WOOD VIOLET. Stem erect, naked below the leafy summit, 4 to 14 inches high; rootstock short, deep-seated; leaf-blades 1 to 3 inches long, ovate or almost round in outline, cordate or truncate at base, palmately 3 to 7-cleft or -divided, the lobes entire or somewhat repandly toothed, and the lateral usually larger; inflorescence somewhat umbellate; peduncles 1 to 2 inches long; petals yellow, all dark-veined towards base, the upper purple on the outside.

Hill slopes or cañons, 1000 to 6500 feet: Cuyamaca Mts.; Sierra Nevada from Tulare Co. to Shasta Co.; Santa Lucia Mts.; North Coast Ranges from Napa Co. to Del Norte and Siskiyou Cos. North to southern Oregon. Apr.-May.

Locs.—Cuyamaca Mts.: Stonewall Mine, *Parish* 4525. Sierra Nevada: Round Mdw., Giant Forest, *Jepson* 669; Sequoia Creek, near Millwood, Fresno Co., *H. P. Kelley;* Wawona, Mariposa Co., *Jepson* 5652; Gentry sta., Yosemite, *Jepson* 10,447; Curtin Mdws., near Tuolumne Big Trees, *Jepson* 10,557; Confidence, Tuolumne Co., *Jepson* 7693; Calaveras Big Trees, *A. L. Grant;* Yankee Jim, Placer Co., *L. S. Smith* 1620; Gold Run, Placer Co., *Sonne;* Bear Valley, Nevada Co., *Jepson* 14,108; Antelope Valley, Sierra Co., *L. S. Smith* 1580; Butterfly Valley, Plumas Co., *R. M. Austin;* Stirling, Butte Co., *Heller* 10,796; Mineral, Tehama Co., *Jepson* 12,332; Fall River mts., ne. Shasta Co., *Baker & Nutting.* Santa Lucia Mts. (acc. *M. S. Baker*). North Coast Ranges: Sonoma (ridges se.), *Brewer* 977; Howell Mt., Napa Range, *Jepson* 513; Franz Valley grade near Calistoga, *Jepson* 14,109; Elk Mt., nw. Lake Co., *Rattan;* Sherwood Valley, Mendocino Co., *Davy* 5240; Gasquet, Del Norte Co., *M. S. Baker;* Sisson, *Jepson* 14,107.

Var. **integrifolia** Wats. Leaf-blades crenate or with a few coarse teeth, but not at all lobed. —Hill slopes and ridges, 1500 to 5000 feet: Cuyamaca Mts.; North Coast Ranges from Napa Co. to western Siskiyou Co.; Plumas Co. to eastern Siskiyou Co. North to southern Oregon. Apr.-July.

Locs.—Cuyamaca Mts., *T. Brandegee.* North Coast Ranges: Howell Mt., Napa Range, *Jepson* 513a; Trinity Summit, n. Humboldt Co., *Manning* 35; Stuarts Fork, Trinity Co., *M. S. Baker;* Dunsmuir, Siskiyou Co., *Hall & Babcock* 4031. Northern Sierra Nevada: Mohawk Valley, Plumas Co., *Lemmon;* Afterthought Mine, Shasta Co., *M. S. Baker;* divide betw. McCloud River and Dead Horse Cañon, e. Siskiyou Co., *Hall & Babcock* 4128.

Refs.—Viola lobata Benth. Pl. Hartw. 298 (1848), "in montibus Sacramento," *Hartweg* 287, that is, Sierra Nevada foothills, Butte Co. (Erythea 5:54); Jepson, Fl. W. Mid. Cal. 233 (1901), ed. 2, 267 (1911), Man. 644, fig. 635 (1925). *V. sequoiensis* Kell. Proc. Cal. Acad. 2:185, fig. 55 (1862), type loc. Nevada City. *V. dactylifera* Greene, Pitt. 3:317 (1898), "Sierra Nevada from Plumas Co. to Fresno Co." Var. integrifolia Wats. Bot. Cal. 1:57 (1876), type loc. Sierra Co., *Lemmon;* Jepson, Fl. W. Mid. Cal. 233 (1901), ed. 2, 267 (1911), Man. 644 (1925).

6. **V. sempervirens** Greene. Redwood Violet. Stems prostrate, stolon-like, sparsely leafy, the foliage evergreen; peduncles commonly longer than the leaves, at first scape-like and arising from the cluster crowning the stipular-scaly rootstock; stipules brown-scarious, ovate-subulate; leaf-blades round-cordate, deep green above, often rusty beneath, finely crenate, in age brown-punctate, ½ to 1¼ inches broad; petioles 1 to 7 inches long; petals uniform light yellow, a little purple-veined, 4 lines long; spurs very short and broad.

Shady woods, 100 to 3600 feet: along the coast, especially in the Redwood belt, from Monterey Co. to Del Norte Co. North to British Columbia. Jan.-Aug.

Locs.—Pico Blanco, Santa Lucia Mts., *Davy* 7354; Soquel Cañon, Santa Cruz Mts., *Jepson* 14,111; Kings Mt., San Mateo Co., *Elmer* 4565; Mill Valley, Marin Co., *Jepson* 14,110; Valley Ford, Sonoma Co., *E. Lobenstein;* Ft. Bragg, *Davy;* Eureka, *Tracy* 978; Hupa Mt., *Chandler* 1292; Crescent City, *P. E. Goddard.*

Refs.—Viola sempervirens Greene, Pitt. 4:8 (1899). *V. sarmentosa* Dougl.; Hook. Fl. Bor. Am. 1:80 (1838), type loc. Ft. Vancouver, Wash., *Douglas;* Jepson, Fl. W. Mid. Cal. 232 (1901), ed. 2, 266 (1911), Man. 644 (1925); not V. sarmentosa Bieberstein (1808).

7. **V. purpurea** Kell. Pine Violet. Plants 2 to 6 inches high, the stems very short and densely tufted, from a stout vertical root, the young herbage purple-tinted, hirsutulose-canescent; leaf-blades rhombic-ovate or oblong (1 or 2 frequently nearly round), dentate or crenate or sometimes nearly entire, ¾ to 1¼ inches long, on petioles 1 to 3 inches long; peduncles surpassing the leaves, 2 to 4 inches long; petals yellow, the upper brownish-purple on the outside, the lower brown-veined at base.

Gravel or clay slopes, in open or wooded country, 1500 to 8500 feet: throughout cismontane California, sparingly on east side Sierra Nevada. North to Oregon, east to Wyoming and Utah. Mar.-July.

Nectary mechanism.—The two anthers on the lower side of the flower stand opposite the odd petal. Each anther-cell is winged on the back, the two wings being contiguous and valvate; the bases of the wings are bathed in the nectar of the short spur of the lower petal.

Locs.—S. Cal.: Descanso, San Diego Co., *T. Brandegee;* Strawberry Valley, Mt. San Jacinto, *Jepson* 1309; Mt. Lowe, *Peirson* 117; Santa Inez Mts., *T. Brandegee.* Tehachapi region: Mohave sta., *Davy* 2165; Girard sta., *Heller* 7721. Coast Ranges: Pozo Range, San Luis Obispo Co., *Jepson* 11,990; North Fork Lewis Creek, se. San Benito Co., *Jepson* 2681; San Benito Peak, San Carlos Range, *Jepson* 14,114; Big Sur River, Santa Lucia Mts., *Davy* 7437; Joaquin Spr., Mt. Hamilton, *Jepson* 4220; Mt. Diablo, *Mary Bowerman;* Vaca Mts., *Jepson* 2183; Howell Mt., Napa Range, *Jepson* 512; Hoods Peak Range, w. of St. Helena, *Jepson* 14,113; Knoxville, ne. Napa Co., *C. F. Baker* 3082; Pinnacle Rock, e. Lake Co., *Dutton;* South Mill Creek, Ukiah, *Jepson* 9265; Willits, *M. S. Baker;* Buck Mt., Humboldt Co., *Tracy* 4149. Sierra Nevada: Limekiln Creek, Tulare Co., *Jepson* 2784; Hume, Fresno Co., *H. P. Kelley;* betw. Oak Flat and Badger, Tulare Co., *H. P. Kelley;* Pinehurst, Fresno Co., *Newlon* 162; Bubbs Creek, Fresno Co., *Ottley* 1471; Bass Lake, Madera Co., *Jepson* 12,865; Chowchilla School, Mariposa Co., *Jepson* 12,797; Crane Flat, Yosemite, *Jepson* 10,445; Columbia, Tuolumne Co., *A. L. Grant* 648; Murphys, Calaveras Co., *Davy* 1555; Bear Valley, Nevada Co., *Jepson* 14,112; Little Summit, Butte Co., *Heller* 11,481; Lassen Peak, *Chesnut & Drew;* Big Valley mts., *M. S. Baker;* Mt. Shasta, *Jepson* 14,120.

Var. **pinetorum** Greene. Leaf-blades mostly lanceolate or oblong-lanceolate, deeply serrate to entire; flowers small, on filiform peduncles; peduncles 1½ to 2½ inches long; petals yellow, all often brownish-purple on the back.—High montane slopes, openings in coniferous forests, 7300 to 8500 feet: San Bernardino Mts. and north to the Sierra Nevada (Tulare Co. to Lassen Co.).

Locs.—Bear Valley, San Bernardino Mts., *Parish* 1796; Alta Mdws., Tulare Co., *Newlon* 27; Mt. Silliman, *Jepson* 737; Nellie Lake, Fresno Co., *A. L. Grant* 1017; Gin Flat, Yosemite, *Jepson* 10,509; Eagle Peak, Yosemite, *Jepson* 4354; Stubblefield Cañon, Tuolumne Co., *Jepson* 4538; Gilmore Lake, Eldorado Co., *Ottley* 890; Snag Lake, Lassen Co., *Jepson* 4114.

Var. **venosa** Brainerd. Dwarf, 1 to 2 (or 4) inches high; lower leaf-blades round-ovate, some of them cordate or subcordate at base, entire or coarsely notched, 5 to 6 lines long, the upper narrower and entire; veins often purple.—Montane, 4000 to 7000 feet: widely dispersed but infrequent, almost throughout cismontane California. East to Utah.

Locs.—Mt. Wilson, *Ottley* 651; Mt. San Antonio, *Peirson* 118; betw. Pine Flats and Chileo, San Gabriel Mts., *Peirson* 2491; San Benito Peak, San Carlos Range, *Jepson* 14,114; Snow Mt., Lake Co., *M. S. Baker;* Truckee, *Sonne* 24; Lassen Peak, *Chesnut & Drew* 19; Hayden Hill, Modoc Co., *L. S. Smith* 923; South Fork Fitzhugh Creek, Warner Mts., *L. S. Smith* 52; Mt. Shasta, *Lemmon;* Humbug, Siskiyou Co., *Butler* 632.

Var. **grisea** Jepson var. n. Dwarf, 1 to 2 inches high; herbage gray-tomentose; leaf-blades mostly narrow-lanceolate, crenate-erosulate or saliently lacerate or some remarkably undulate-crenate, ¾ to 1 inch long, the petioles ½ to 1¼ inches long; petals yellow.—(Planta humilis, unc. 1–2 alta; herbae canescentes, tomentosae; plerumque folia anguste lanceolata, vel insigniter undulato-crenata, unc. ¾–1 longa; petioli unc. ½–1¼ longi; petala lutea.)—High montane, on sandy flats, 6000 to 8500 feet: Sierra Nevada in Tulare Co. (Templeton Mdws., Kern River, *Jepson* 4977, type); Tehachapi Mts. (Bear Mt., *Jepson* 7174).

Var. **aurea** M. S. Baker in herb., comb. n. Herbage more or less tomentose, the petioles conspicuously pilose; basal leaf-blades coarsely and often regularly dentate or sinuate-dentate, the teeth with white glandular tips.—Sandy or rocky soil, 2500 to 5800 feet: east slope or east side Sierra Nevada, often in piñon belt or among sagebrush.

Locs.—Nevada: Verdi, Washoe Co., *Sonne;* Reno, *Kennedy.*

Refs.—VIOLA PURPUREA Kell. Proc. Cal. Acad. 1:56 (1854), type from Cal. presumably but loc. not stated except as "from the interior"; Jepson, Fl. W. Mid. Cal. 232 (1901), ed. 2, 266 (1911), Man. 645, fig. 636 (1925). Var. PINETORUM Greene, Fl. Fr. 243 (1891). *V. pinetorum* Greene, Pitt. 2:14 (1889), type loc. Tehachapi, Kern Co., *Greene;* Jepson, Man. 645 (1925). Var. VENOSA Brainerd, Vt. Agr. Exp. Sta. Bull. 224:111, fig. 48c (1921); Jepson, Man. 645 (1925). *V. nuttallii* var. *venosa* Wats. Bot. King 35 (1871), type loc. "in the mts. from the west Humboldt to the Wahsatch", *Watson* 145. *V. aurea* var. *venosa* Wats.; B. & W. Bot. Cal. 1:56 (1876). *V. praemorsa* var. *venosa* Gray, Syn. Fl. 1^1:200 (1895). *V. venosa* Rydb. Mem. N. Y. Bot. Gard. 1:262 (1900). Var. GRISEA Jepson. Var. AUREA M. S. Baker. *V. aurea* Kell. Proc. Cal. Acad. 2:185, fig. 54 (1862), type from "Nevada territory".

8. **V. nuttallii** Pursh. SHEEP VIOLET. Plants 2 to 5 (or 7) inches high, the short stems leafy but the leaves mostly basal; peduncles shorter than or scarcely exceeding the leaves; herbage puberulent, sometimes canescent, sometimes glabrous or nearly so; leaf-blades oblong-lanceolate to lanceolate or ovate, entire or slightly denticulate or crenulate, 1 to 2 inches long, rather shortly attenuate at base into the petiole; petioles 1 to 6 inches long; petals yellow, the lowest brown-veined, 2 to 4 lines long; capsule glabrous.

Meadows or dry pine woods, 4300 to 7500 feet: North Coast Ranges from northern Humboldt Co. to Siskiyou Co.; Sierra Nevada from Kern Co. to Shasta and Modoc Cos. North to Washington, east to the Rocky Mts. Apr.-July.

Note on variation.—The plants are sometimes loose; they are often compact. The leaves vary in size and shape; in a given collection they are glabrous, or ciliate, or ciliate and also puberulent on the nerves, or generally puberulent (especially on the lower side). These various states of pubescence are not, however, associated with any definite leaf shapes or any particular habit of the plant. Leaves with scantily pubescent nerves may be found on the same individuals as leaves with densely pubescent nerves (Parks ranch, Lassen Peak, *Hall & Babcock* 4325). Ciliate leaves and non-ciliate leaves, likewise, may be borne on the same individual (Forestdale, sw. Modoc Co., *M. S. Baker*).

Locs.—North Coast Ranges: Trinity Summit, *Davy* 5805; Oro Fino, Siskiyou Co., *Butler* 1209. Sierra Nevada: Greenhorn Mts., *Peirson* 10,692; Hog Ranch, Tuolumne Co., *Hall* 8901; Squaw Valley, Placer Co., *Sonne;* Dog Valley, Sierra Co., *Sonne;* Burney Valley, Shasta Co., *Baker & Nutting;* McCloud, Siskiyou Co., *Condit;* Dixey Mts., Lassen Co., *Baker & Nutting;* West Valley, Warner Mts., *L. S. Smith* 760; Goose Lake Valley, ne. Modoc Co., *R. M. Austin;* Fort Bidwell, *Manning* 80.

Var. **linguaefolia** Jepson. Plants rather compact, 2 to 2½ inches high; leaf-blades broadly ovate to elliptic or elliptic-ovate, obtuse, ¾ to 1½ inches long, the petioles 1 to 1½ times as long. —Montane, Placer Co. to Siskiyou Co., 6000 to 8000 feet: Truckee River, *Sonne* 24; Hot Springs Valley (ridge n.), Lassen Peak, *Jepson* 12,284; Marble Mt., *Jepson* 2841. North to Washington.

Var. **praemorsa** Wats. Long-leaf Violet. Plants 2½ to 10 inches high; leaves and flowering peduncles at first arising directly from the erect or ascending rootstocks, later developed on the erect or ascending stems; herbage villous-pubescent to nearly glabrous; leaf-blades entire or slightly repand-crenulate or barely denticulate, 1 to 3 inches long, more or less attenuate into the long margined petiole; petioles 3 to 6 inches long; petals canary-yellow, more or less tinged with brown or purple, 5 to 6 lines long; capsule ovate, pubescent.—Open grassy slopes or swales in pine woods, 1700 to 5000 feet: Mendocino Co. to Humboldt Co.; Sierra Nevada from Placer Co. to Shasta and Modoc Cos. North to British Columbia, east to the Rocky Mts. May-June.

Locs.—North Coast Ranges: Sherwood Valley, Mendocino Co., *Davy* 5212; Harris, Mail Ridge, Humboldt Co., *Chandler* 1085; South Yager Creek, Humboldt Co., *Tracy* 6067; Buck Mt., Humboldt Co., *Tracy* 4159; Kneeland Prairie, Humboldt Co., *Tracy* 2667. Ne. Cal.: Burney Valley, Shasta Co., *M. S. Baker;* Forestdale, sw. Modoc Co., *M. S. Baker;* Adin, Modoc Co., *L. S. Smith* 921; Goose Lake, ne. Modoc Co., *Austin & Bruce* 2255; Fort Bidwell, *Manning*.

Refs.—VIOLA NUTTALLII Pursh, Fl. 1:174 (1814), type from "the Missouri River," *Nuttall;* Jepson, Man. 645 (1925). Var. LINGUAEFOLIA Jepson, Man. 645 (1925). *V. linguaefolia* Nutt.; T. & G. Fl. 1:141 (1838), type loc. "Kamas Prairie near the sources of the Oregon", *Wyeth. V. nuttallii* subsp. *linguaefolia* Piper; Piper & Beattie, Fl. Se. Wash. 166 (1914). *V. bakeri* Greene, Pitt. 3:307 (1898), type loc. Bear Valley, Shasta Co., *M. S. Baker*. Var. PRAEMORSA Wats. Bot. King 35 (1871). *V. praemorsa* Dougl.; Lindl. Bot. Reg. t. 1254 (1829), type loc. banks of the Columbia River, *Douglas;* Jepson, Man. 645 (1925). *V. nuttallii* subsp. *praemorsa* Piper, Contrib. U. S. Nat. Herb. 11:393 (1906).

9. **V. glabella** Nutt. Pioneer Violet. Stems erect, mostly weak, naked below or nearly so, 3 to 12 inches high; rootstock horizontal, thick, fleshy-scaly, often branching; herbage glabrous or puberulent, bright green; blades of basal leaves reniform-cordate, 1½ to 3¾ inches wide, mostly wider than long, on elongated (2 to 11 inches) petioles, the cauline similar or cordate, on petioles 4 to 5 lines long; stipules small and thin-membranous; peduncles about 1½ inches long; petals bright yellow, the lateral and lower purple-veined, 3 to 6 lines long, the lateral ones bearded; spur short and saccate; capsule oblong, 4 lines long, abruptly beaked.

Wet places in woods: Coast Ranges, 25 to 6500 feet, from Monterey Co. to Siskiyou Co.; Sierra Nevada, 3500 to 8000 feet, from Tulare Co. to Modoc Co. North to Alaska, east to the northern Rocky Mts. Mar.-July.

Locs.—Coast Ranges: Santa Cruz, *Heller* 6555; Pilarcitos Creek, San Mateo Co., *Davy* 1056; Redwood Peak, Oakland Hills, *Jepson* 6862; Villa Grande, Russian River, *Dorothea Gorter;* Cazadero, Sonoma Co., *Davy* 1653; Camp Grant, Eel River, *Jepson* 16,376; Hydesville, Humboldt Co., *Tracy* 4018; Trinity Summit, *Jepson* 2057; Shasta Sprs., Siskiyou Co., *Butler* 653; Whiskey Camp, Independence Creek, Siskiyou Co., *Butler* 144; Quartz Valley, Siskiyou Co., *Butler* 1233. Sierra Nevada: Giant Forest, *K. Brandegee;* Huckleberry Mdws. near Grant Park, *Newlon* 206; Pine Ridge, Fresno Co., *Hall & Chandler* 160; Crane Flat, Mariposa Co., *Jepson* 10,438; Peregoy Mdw., Yosemite, *Jepson* 4342; Calaveras Big Trees, *A. L. Grant;* Grass Lake, Eldorado Co., *Pendleton & Reed* 1007; Blue Cañon, Placer Co., *H. A. Walker* 1229; Quincy, *MacNaught;* Battle

Creek Mdw., e. Tehama Co., *Jepson* 12,265; Hatchet Creek, Shasta Co., *Baker & Nutting;* Davis Creek, Modoc Co., *R. M. Austin.*

Refs.—Viola glabella Nutt.; T. & G. Fl. 1:142 (1838), type loc. "shady woods of the Oregon" (Columbia River), *Nuttall;* Jepson, Fl. W. Mid. Cal. 232 (1901), ed. 2, 267 (1911), Man. 645 (1925).

10. **V. pedunculata** T. & G. Grass Pansy. Plants 4 to 13 inches high; stems from a thick and short deeply seated rootstock, branching at the surface of the ground; leaf-blades round-ovate, usually with a truncate base, coarsely crenate, ½ to 1¾ inches long, on petioles 1 to 2¾ inches long; stipules foliaceous, narrowly lanceolate, uppermost often sparingly incised; peduncles erect, 4 to 5 (or 7) inches long, much surpassing the leaves, bearing flowers ¾ to 1⅛ inches broad; petals golden-yellow, the upper ones dark brown on the outside, the others purple-veined within; lateral petals with a bearded spot; stigma bearded.

Open grassy hills and valleys, 100 to 2000 feet: Coast Ranges from Napa Co. to San Luis Obispo Co.; Sacramento Valley; Sierra Nevada in Tulare Co.; coastal Southern California from Santa Barbara Co. to San Diego Co. South to Lower California. Feb.-May. It is also called Yellow Pansy and, by Spanish-Californians, Gallito.

Locs.—Coast Ranges: Mt. George, Napa Range, *Jepson;* Russian River below Guerneville, *Davy;* Ross Valley, Marin Co., *Jepson* 14,115; Angel Isl., San Francisco Bay, *Earle Mulliken* 95; Berkeley, *Docia Patchett;* Redwood Peak, Oakland Hills, *Jepson* 6861; Mt. Diablo, *Jepson* 9849; Mt. Davidson, San Francisco, *Jepson* 10,340; Lake Merced, San Francisco, *Jepson* 14,116; Arroyo Mocho, se. Alameda Co., *Jepson* 10,680; Mt. Hamilton, *Chandler* 6020; Guadalupe Mine, Santa Cruz Mts., *Jepson* 9092; Little Arthur Creek, w. of Gilroy, *Jepson* 9712a; Santa Cruz, *Berg;* Pacheco Pass, *M. S. Baker;* Monterey, *Elmer* 3514; Slack Creek, se. Monterey Co., *Jepson* 12,037; Paso Robles, *Jepson* 8440; La Cuesta Pass, Santa Lucia Mts., *Jepson* 11,963. Sacramento Valley: College City, Colusa Co., *R. S. Ferris;* Sacramento (5 mi. n.), *M. S. Baker;* Vanden, Solano Co., *Jepson* 9615. Sierra Nevada: Springville, Tulare Co., *Purpus* 5081. Coastal S. Cal.: Purisima Hills, n. Santa Barbara Co., *Jepson* 12,652; Los Alamos, *Jepson;* Santa Rosa Isl., *T. Brandegee;* Pelican Bay, Santa Cruz Isl., *Jepson* 12,116; San Clemente Isl., *Munz* 6660; Sulphur Mt., Ventura Co., *Epling & Anderson;* Santa Monica, *Barber* 54; La Tuna Cañon, Verdugo Hills, *F. A. McFadden* 12e; Lukens Peak trail, San Gabriel Mts., *Peirson* 332; San Bernardino, *Parish;* Riverside, *Jepson* 1235; Santa Ana Mts., *Alice King;* La Mesa, w. San Diego Co., *Jepson* 6681.

Refs.—Viola pedunculata T. & G. Fl. 1:141 (1838), type from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. 232 (1901), ed. 2, 266 (1911), Man. 645, fig. 637 (1925).

11. **V. ocellata** T. & G. Pinto Pansy. Stems erect, 5 to 12 inches high, from rootstocks; leaf-blades cordate- to triangular-ovate, crenate, acute or abruptly acuminate or somewhat pointed at apex, 1 to 2½ inches long, the basal leaves long-, the cauline short-petioled; stipules small and scarious; peduncles mostly shorter than the leaves; petals 5 to 7 lines long; petals white, the two upper violet-purple on the outside, the lower one purple-veined at base and with a small yellow spot near spur.

Open or shady woods, 500 to 3000 feet: Coast Ranges from Monterey Co. to Humboldt Co., chiefly in the Redwood belt; Shasta Co. Mar.-June.

Locs.—Coast Ranges: Monterey, *Parry & Lemmon;* Gilroy (hills w.), *Jepson* 14,118; New Almaden, *Geo. Thurber;* Glenwood, Santa Cruz Mts., *Bioletti;* Black Mt., Santa Clara Co., *Elmer* 4540; Kings Mt., San Mateo Co., *C. F. Baker* 333; Mt. Tamalpais, *Eastwood;* Bodega, *Vina W. Krager;* Guerneville, *Lemmon;* Willits, *Docia Patchett;* Rowes sta., Mendocino Co., *Chandler* 1056; Bridgeville, Humboldt Co., *Tracy* 6629; Willow Creek, Trinity River Valley, *Tracy* 6034. Shasta Co.: Ingot, acc. *M. S. Baker.*

Refs.—Viola ocellata T. & G. Fl. 1:142 (1838), type from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. 231 (1901), ed. 2, 266 (1911), Man. 646, fig. 638 (1925).

12. **V. cuneata** Wats. Butterfly Violet. Stems leafy, ascending from a short thickish rootstock, 2 to 7 inches long; herbage glabrous; blades of basal leaves deltoid- or round-ovate, abruptly acute, truncatish or subcuneate at base, serrulate or crenulate, ½ to 1 inch long, the petioles slender; blades of cauline leaves rhombic- to oblong-ovate; peduncles little exceeding the leaves; petals 4 to 6 lines long, the

two upper cream-color, deep purple on the back, the 3 lower ones paler or whitish, the lateral with a purple blotch at base, the lower purple-veined at base, bordered or blotched with white; spur short, yellowish.

Red, serpentine or rocky soil, under pines, 2000 to 5000 feet: North Coast Ranges from Mendocino Co. to Shasta and Del Norte Cos. North to southwestern Oregon. Mar.-June.

Locs.—Red Mt., n. Mendocino Co., *Jepson* 16,514; Horse Mt., Humboldt Co., *Tracy* 7615; Willow Creek, Humboldt Co., *Rattan;* Hupa Mt., n. Humboldt Co., *Tracy* 7560; Granite Peak, Trinity Co., acc. *M. S. Baker;* Castella, Shasta Co., acc. *M. S. Baker;* Castle Lake, Siskiyou Co., *Lemmon;* Gasquet, Del Norte Co., *Eastwood*. Oregon: Waldo, *M. S. Baker*.

Refs.—VIOLA CUNEATA Wats. Proc. Am. Acad. 14:290 (1879), type loc. ridge s. of Trinity River, Humboldt Co., *Rattan;* Jepson, Man. 646 (1925).

13. **V. adunca** Sm. WESTERN DOG VIOLET. Stems tufted, very short (3 to 6 lines long) or becoming 1 to 4 inches long, leafy; leaf-blades round-ovate to elliptic-ovate, the lower inclining to be subcordate, obscurely crenate, ⅓ to 1 inch long; peduncles surpassing the leaves; petals violet, turning to red-purple, 4 to 6 lines long, the lateral strongly bearded on the upper side at base, the upper pair with a slight tuft in the middle at base; spur varying from much shorter to quite as long as the petals.

Meadows: Southern California mountains, 6000 to 7000 feet (Palomar Mt.; San Bernardino Mts.); Coast Ranges, on hilltops near the sea (50 to 2000 feet) from Monterey Co. to Del Norte Co., or in the inner Coast Ranges from Lake Co. to Siskiyou Co. (3000 to 6000 feet); Sierra Nevada, 5000 to 7500 feet, from Tulare Co. to Modoc Co. North to Alaska, east to the Rocky Mts. Mar.-Aug.

Locs.—S. Cal. mts.: Palomar Mt. (Bull. S. Cal. Acad. 23:164); Talmadge Mill, San Bernardino Mts., *Parish* 3398. Coast Ranges: Pajaro Hills, n. Monterey Co., *Chandler* 385; Pigeon Pt., San Mateo Co., *Follett;* Mt. Davidson, San Francisco, *Jepson* 10,343; Inverness, Marin Co., *Jepson* 2465; Ft. Ross, *Davy* 1676; Elk Mt., n. Lake Co., *Tracy* 2290; Eureka, *Tracy* 1082; Crescent City, *Brewer* 2203; Marble Mt., Siskiyou Co., *Chandler* 1585; Quartz Valley, Siskiyou Co., *Butler* 606. Sierra Nevada: Mt. Silliman, Tulare Co., *Brewer* 2807; Huckleberry Mdws. near Grant Park, *Newlon* 209; Crane Flat, Mariposa Co., *Jepson* 10,441; Eagle Peak, Yosemite, *Jepson* 4372; Hetch-Hetchy, *A. L. Grant* 812; Jonesville, Butte Co., *Copeland;* East Fork King Creek, se. Shasta Co., *Jepson* 4110; Mineral, Tehama Co., *J. Grinnell;* High Grade, n. Warner Mts., *L. S. Smith* 948.

Var. **oxyceras** Jepson. Peduncles mostly shorter than the leaves; spur narrow, acute, about as long as the petals.—Shady spots, 6000 to 9500 feet: Sierra Nevada from Fresno Co. (Dinkey Creek, *Hall & Chandler* 399) to Mariposa Co. (Tuolumne Mdws., *Hall & Babcock* 3541) and Nevada Co. Also in Washington. It appears to be an unimportant mutant.

Refs.—VIOLA ADUNCA Sm.; Rees, Cyclop. 37, n. 63 (1817), type loc. "west coast of N. Am.", *Menzies;* Jepson, Man. 647, fig. 639 (1925). *V. canina* var. *adunca* Gray; Brew. & Wats. Bot. Cal. 1:55 (1876); Jepson, Fl. W. Mid. Cal. 231 (1901), ed. 2, 266 (1911). *V. filipes* Greene, Pitt. 4:289 (1901), type from Modoc Co., *M. S. Baker*. Var. OXYCERAS Jepson, Man. 647 (1925). *V. canina* var. *oxyceras* Wats.; B. & W. Bot. Cal. 1:56 (1876), type loc. Yosemite Valley, *Brewer*. *V. adunca* subsp. *oxyceras* Piper, Contrib. U. S. Nat. Herb. 11:395 (1906).

14. **V. nephrophylla** Greene. CIMARRON VIOLET. Plants 3 to 8 inches high, the leaves and scape-like peduncles arising directly from a short thick rootstock; herbage glabrous; leaf-blades ovate-reniform or -cordate, crenate, ¾ to 2¼ inches long, on petioles 2 to 6 inches long; peduncles usually exceeding the leaves; petals pale violet, 5 to 7 lines long, the lower and lateral strongly bearded, the spur saccate.

Shady moist ground, 3000 to 6000 feet: San Jacinto, San Bernardino and San Gabriel mountains; Sierra Nevada (east side or easterly valleys) from Inyo Co. to Modoc Co. North to British Columbia, east to Quebec, south in the Rocky Mts. to New Mexico. Mar.-June.

Locs.—Cismontane S. Cal.: Coahuila Valley, *Hall* 1928; Mill Creek, San Bernardino Mts., *Jepson* 5570; Edgar Cañon, San Bernardino Mts., *Hall* 99; Seven Oaks, *Parish;* Lytle Creek Cañon, San Antonio Mts., *Hall* 892. Sierra Nevada: Bishop Creek, Inyo Co., *Shockley* 432; Donner Lake, *Sonne;* White Horse Lake, Modoc Co., *M. S. Baker;* West Valley, Warner Mts., *L. S. Smith* 811; Ft. Bidwell, *Manning* 123.

Refs.—VIOLA NEPHROPHYLLA Greene, Pitt. 3:144 (1896), type loc. valley of Cimarron River, w. Colo., *Greene;* Jepson, Man. 647 (1925). *V. cucullata* B. & W. Bot. Cal. 1:55 (1876); not V. cucullata Ait. (1789). *V. cognata* Greene, Pitt. 3:145 (1896), "northern Rocky Mts. and westward". *V. austinae* Greene, Pitt. 5:30 (1902), based on spms. from Plumas Co., *R. M. Austin,* and from Lassen Co., *M. S. Baker. V. obliqua* of Cal. authors.

15. **V. palustris** L. MARSH VIOLET. Peduncles scape-like, these and the leaves arising directly from the slender or filiform rootstock, 3 to 5 inches high; leaf-blades round-cordate, 1 to 2 inches long; petals pale violet, sometimes white, 3 to 5 lines long.

Wet brushy places or shaded edges of swamps, 5 to 200 feet: Mendocino Co. to Del Norte Co. North to Alaska, east to Labrador, south to Colorado and Utah; Europe, Asia. May-July.

Locs.—Noyo, Mendocino Co. acc. *M. S. Baker;* Eureka, *Tracy* 6242; Big Lagoon, Humboldt Co., *Tracy* 7919.

Refs.—VIOLA PALUSTRIS L. Sp. Pl. 934 (1753), type from Europe; Jepson, Man. 647 (1925). *V. howellii* and *langsdorffii* Jepson, Man. 647 (1925); not V. howellii Gray (1887) nor V. langsdorffii Fisch. (1824).

16. **V. blanda** Willd. var. **macloskeyi** Jepson. WESTERN WHITE VIOLET. Plants ¾ to 3 inches high; peduncles scape-like, these and the leaves arising from underground filiform rootstocks; herbage glabrous or nearly so; leaf-blades ovate-cordate to round-reniform, crenulate, thin, ¼ to 1½ inches long, on slender marginless petioles; flowers faintly sweet-scented; sepals oblong-lanceolate to broadly lanceolate; petals white, 3 to 4 lines long, commonly beardless, the lowermost usually conspicuously dark-veined.

Wet meadows and creek margins, high montane, 4000 to 10,000 feet: San Jacinto and San Bernardino mountains; Sierra Nevada from Tulare Co. to Siskiyou Co.; North Coast Ranges from Lake Co. to Siskiyou Co. North to Canada, east to Colorado. June-Sept.

Field note.—The lower broadly obovate petal is the largest; it is purplish- or brown-veined on the white ground. The lateral petals are subject to a half twist, thus causing the upper portion of blade to face downward; at the auricle near the base on the upper side they have a small hairy spot. The upper petals are obovate and turned backward and upward.—Seavey Pass, near Kerrick Cañon, Sierra Nevada.

Locs.—Mt. San Jacinto (Univ. Cal. Publ. Bot. 1:95); Bluff Lake, San Bernardino Mts., *Munz* 5627. Sierra Nevada: Junction Mdw., Kern Cañon, *Jepson* 1052; Mt. Silliman, *Jepson* 745; Huckleberry Mdws., near Grant Park, *Newlon* 207; McKinley Big Trees, *Jepson* 16,016; Huntington Lake, *E. Ferguson* 363; Crane Flat, Mariposa Co., *Jepson* 10,436; betw. Yosemite Falls and Eagle Peak, *Jepson* 4351; Matterhorn Cañon, Tuolumne Co., *Jepson* 3366; Herring Creek, South Fork Stanislaus River, *A. L. Grant* 111; Calaveras Big Trees, *A. L. Grant;* Mineral, Tehama Co., *J. Grinnell;* Lassen Peak, *Jepson* 4094; Mt. Shasta (N. Am. Fauna 16:154). North Coast Ranges: Mt. Hull; South Fork Mt., e. Humboldt Co., *Tracy* 8974.

Refs.—VIOLA BLANDA Willd. Hort. Berol. t. 24 (1816), type from North America. Var. MACLOSKEYI Jepson, Man. 648, fig. 640 (1925). *V. macloskeyi* Lloyd, Erythea 3:74 (1895), type loc. Cascades se. of Mt. Hood, Ore., *Lloyd. V. blanda* Jepson, Man. l.c. *V. anodonta* Greene, Pitt. 5:32 (1902), type loc. "mts. of Fresno Co." (that is Peckinpah Mill, now Madera Co.), *Peckinpah. V. parnassifolia* Greene, l.c., type loc. Butterfly Valley, Plumas Co., *R. M. Austin.*

17. **V. occidentalis** Howell. WESTERN PRIMROSE VIOLET. Peduncles scape-like, these and the leaves arising directly from the rootstock, 3 to 6 inches high; herbage glabrous; leaf-blades ovate to rhomboid-ovate, ¾ to 2 inches long, attenuate at base into a long petiole; petals white, the lower veined with purple, the lateral ones with a bearded spot.

Marshes, 5 to 2500 feet: Del Norte Co. North to southwestern Oregon. Apr.

Loc.—Gasquet, *Eastwood.*

Refs.—VIOLA OCCIDENTALIS Howell, Fl. Nw. Am. 69 (1897); Jepson, Man. 648 (1925). *V. primulaefolia* var. *occidentalis* Gray, Bot. Gaz. 11:255 (1886), type loc. Waldo, Ore., *T. Howell.*

LOASACEAE. Loasa Family

Herbs or bushes with either rough or stinging hairs, and often with white deciduous bark. Leaves in ours alternate. Flowers regular, complete, white, yellow or reddish. Calyx-limb 5-lobed. Petals 5 (rarely 8 or 10). Stamens usually very numerous, sometimes few and definite, inserted with the petals on the base of the calyx-tube. Ovary inferior, 1-celled; style 1, entire or cleft. Fruit a capsule, crowned with the calyx-lobes.—Genera 13, species 250, South and North America (especially Chile to California), and 1 monotypic genus in South Africa and Arabia.

Bibliog.—Urban, I., and Gilg, E., Monographia Loasacearum (Nova Acta Acad. Nat. Cur. 76¹:1–384, t. 1–8,—1900). Rydberg, P. A., Some generic segregations: Bicuspidaria, Touterea, Acrolasia (Bull. Torr. Club 30:275–278,—1903). Heller, A. A., Botanical Exploration in California: Loasaceae (Muhl. 2:98–100,—1905). Greene, E. L., The genus Nuttallia (Lflts. 1:209–210,—1906). Davidson, A., A revision of the western Mentzelias (Bull. S. Cal. Acad. 5:13–18,—1906). Macbride, J. F., A revision of Mentzelia, sect. Trachyphytum (Contrib. Gray Herb. 56:24–28,—1918).

Stamens many; seeds few to many.
Stamens inserted below petals; seeds on 3 parietal placentae; style entire or 3-cleft.......1. Mentzelia.
Stamens inserted on the petals; seeds on 5 parietal placentae.
Corolla with petals united only at base, the stamens adnate to the united bases; style 5-cleft.......2. Eucnide.
Corolla sympetalous, the stamens borne on the tube; style entire.......3. Sympetaleia.
Stamens 5; style entire; seed solitary.......4. Petalonyx.

1. MENTZELIA L.

Erect or diffuse herbs. Leaves in age brittle, adhering very tightly to clothing by means of barbed hairs. Flowers terminal, solitary or cymose, small or showy. Capsule dehiscent at the summit, few to many-seeded. Placentae 3, seldom 5 or 6. Seeds prismatic, irregularly angled or flat; endosperm scanty.—Species about 55, North and South America, mostly tropical and subtropical. (C. Mentzel, a German botanist of the 17th century.)

In Mentzelia in general corolla size is variable. The characters of the mature seed are here regarded as the most dependable. The style is more or less 3-cleft, save that in M. micrantha it is entire. The petals are about 8 in M. reflexa. In the series Mentzelia dispersa-affinis and in the gracilenta-albicaulis series the species seem to overlap and are difficult of discrimination.

A. Seeds flattish, broadly wing-margined; stamens numerous, the 5 to 10 outer filaments petaloid.

Biennials.
Petals broadly oblanceolate, 1¾ to 2½ inches long; 5 outer filaments petaloid but fertile; cismontane and transmontane.......1. *M. laevicaulis.*
Petals narrowly obovate, 4 to 8 lines long; transmontane.
Calyx-lobes eventually deciduous, the short calyx-tube persistent as a narrow cup on the capsule.......2. *M. multiflora.*
Calyx-lobes persistent, divided almost down to the capsule (calyx-tube essentially none)..3. *M. leucophylla.*
Perennial; calyx with a short tube at base, the entire calyx persistent on the capsule; Mono Co.....4. *M. torreyi.*

B. Seeds not broadly wing-margined; annuals.

Seeds rugulose with rounded angles and 2 to 4 deep folds; transmontane deserts.
Outer filaments dilated above and prolonged on either side of the anther as a shoulder or tooth.
Flowers subtended and the ovary concealed by a pair of white scarious bracts with green laciniate margin; prolongation of filament equaling or exceeding the anther; capsules erect.......5. *M. involucrata.*
Flowers subtended by small foliaceous bracts not concealing the ovary; prolongation of filament not equaling the anther.
Capsules linear, erect, 10 to 12 lines long.......6. *M. peirsonii.*
Capsules oblong, deflexed in age, 4 to 5 lines long.......7. *M. tricuspis.*
Filaments filiform or somewhat dilated but not produced on either side of the anther; capsules reflexed.......8. *M. reflexa.*
Seeds minutely tuberculate or appearing smooth; outer filaments petaloid or filiform but not produced on either side of anther (except in no. 9).

Seeds prismatic, appearing smooth, usually grooved on the angles.
Flowers subtended and partly hidden by herbaceous bracts; five of the filaments petaloid, produced on either side of anther........9. *M. micrantha.*
Flowers not hidden by floral leaves or bracts; filaments not dilated.
Petals 1 to 2½ lines long; leaves commonly entire, rarely toothed....10. *M. dispersa.*
Petals 2½ to 3½ lines long; leaves usually deeply pinnatifid........11. *M. affinis.*
Seeds irregularly angled, minutely but evidently tuberculate; filaments all filiform or somewhat dilated or united at base.
Floral bracts white-membranous, nearly concealing ovary; petals 3 to 6 lines long; filaments all filiform........12. *M. congesta.*
Floral bracts not white-membranous, not concealing ovary.
Petals 12 to 15 lines long; about 15 of the filaments with somewhat dilated bases; cismontane........13. *M. lindleyi.*
Petals 1 to 7 lines long; filaments all filiform or dilated and somewhat united at base.
Petals 3½ to 7 lines long; stems greenish, usually puberulent, except vars. nitens and eremophila; coastal and interior........14. *M. gracilenta.*
Petals 1 to 3 lines long; stems very white, often glabrous; transmontane deserts........15. *M. albicaulis.*

1. **M. laevicaulis** T. & G. BLAZING STAR. Stout branching biennial, 2 to 3½ feet high, with shining white nearly smooth stems; leaf-blades narrowly oblong or lanceolate, sinuately toothed, 3 to 9 inches long; flowers in clusters of 2 or 3 at the ends of the branches, 3 to 4 inches broad; calyx-segments lanceolate, 1 to 1¼ inches long, reflexed in fruit; petals broadly oblanceolate, light yellow, 1¾ to 2½ inches long, the numerous stamens almost as long; 5 stamens with petaloid filaments; capsule narrowly oblong, 1¼ to 1⅝ inches long; seeds flat, obovate, 1½ to 2 lines long, with a thin margin ¼ to ½ line wide.

Sand and gravel bars in river bottoms or on dry hillsides, 200 to 7000 feet: cismontane Southern California north of San Diego Co.; Mohave Desert; east side of the Sierra Nevada from Inyo Co. to Modoc Co.; Sierra Nevada foothills from Tulare Co. to Plumas Co.; inner and middle Coast Ranges from Monterey Co. to Siskiyou Co. East to Wyoming, north to Washington. June-Oct.

Geog. note.—Mentzelia laevicaulis is conspicuously a tenant of the bottoms of winter flood streams in the interior. It does not enter the Redwood belt save on its inner border in a few favorable stream-bed localities and everywhere keeps back of the coast line, except perhaps near the coast southward. On the plain of the Great Valley it never occurs, probably, except in stream beds near the foothills, but it is found throughout the Sierra Nevada foothills save that, as in the case of a number of other foothill species, it skips the Kaweah River system as it ranges south. By the Spanish-Californians it is called Buena Mujer.

Locs.—Cismontane S. Cal.: San Jacinto Valley, *C. V. Meyer* 209; Mentone, *R. J. Smith;* San Bernardino Mts. (Pl. World 20:223); Lytle Creek Cañon, San Antonio Mts., *Abrams* 2686; Mono Flat, Santa Barbara Co., *A. L. Grant* 1686. Transmontane: Whitewater Cañon, e. end San Bernardino Mts., *Clary* 11; Providence Mts., e. Mohave Desert, *T. Brandegee;* Black Cañon, White Mts., *Duran* 2848; Truckee, *Sonne;* Honey Lake, acc. *L. S. Smith;* Lake City, e. Modoc Co., *Jepson* 7924. Sierra Nevada foothills: Jordan Hot Sprs., Tulare Co., *Elsie Zeile* 104; Tehipite Valley, Fresno Co., *E. Ferguson* 529; Mormon Creek, Tuolumne Co., *W. J. Williamson* 325; betw. Smartsville and Marysville, acc. *L. S. Smith;* Challenge, Yuba Co., acc. *L. S. Smith;* Twain, Plumas Co., *E. Fritz.* Coast Ranges: Cruikshank Creek, Monterey Co., *Condit;* White Sulphur Creek, St. Helena, *Jepson* 9830; Winters, *Jepson;* Berryessa Valley, *J. W. Castner;* Healdsburg, *Jepson* 9429; Ukiah, *Condit;* Grindstone Creek near junction Stony Creek, w. Glenn Co., *Jepson* 16,311; Old Camp Grant, Eel River, *Jepson* 16,397; Yreka, *Butler* 1789.

Refs.—MENTZELIA LAEVICAULIS T. & G. Fl. 1:535 (1840); Jepson, Fl. W. Mid. Cal. 323 (1901), ed. 2, 268 (1911), Man. 649, fig. 641 (1925). *Bartonia laevicaulis* Dougl.; Hook. Fl. Bor. Am. 1:221, t. 69 (1834), type loc. Great Falls of the Columbia River, *Douglas. Touterea laevicaulis* Rydb. Bull. Torr. Club 30:276 (1903). *Nuttallia laevicaulis* Greene, Lflts. 1:210 (1906). *Bartonia parviflora* Dougl.; Hook. Fl. Bor. Am. 1:221 (1834), type loc. interior parts of the Columbia River, *Douglas. M. parviflora* Mcbr. Contrib. Gray Herb. 65:41 (1922); not M. parviflora Hel. (1898) or Acrolasia parviflora Hel. (1906). *Bartonia ornata* Hook. Lond. Jour. Bot. 6:226 (1847), type loc. cataracts of Spokane River, *Geyer;* not B. ornata Pursh (1818). *M. ornata* Torr. Stansb. Exp. Great Salt Lake 387 (1852), type loc. islands of Salt Lake, *Stansbury;* not M. ornata T. & G. (1840).

2. **M. multiflora** Gray. YERBA AMARILLA. Stem shining-white, freely and often diffusely branched, 8 to 24 inches high; herbage harshly short-hispid; leaf-

blades oblong to oblanceolate, entire to sinuate-pinnatifid, 1 to 3 inches long, the upper sessile, the lower with winged petioles; flowers numerous, terminal on the branches in cymose clusters, subtended by a minute lanceolate bract; calyx-teeth lanceolate-subulate, 3½ lines long, closely reflexed in flower, spreading or erect in fruit; petals narrowly oblong or obovate, 4 to 8 lines long; stamens numerous; about 10 filaments of outer stamens dilated or petaloid, the 5 alternate the petals with anthers, the others without anthers; capsule broadly oblong-obconic, 5 to 8 lines long, 3 to 4½ lines wide, commonly naked at summit in maturity, that is, the calyx-lobes deciduous; seeds white, flat, broadly wing-margined.

Sandy washes and river bottoms, 100 to 3500 feet: eastern Mohave Desert; lower Colorado River Valley. South to Mexico, east to Wyoming and Texas. May-Aug.

Note on the flower.—Alternate with the corolla circle of 5 are 5 petaloid stamens a little shorter than the petals, commonly but not always with an anther at the rounded apex; next are borne 15 stamens with dilated filaments, all anther-bearing; after which there are about 50 to 75 ordinary stamens.

Locs.—Yermo, central Mohave Desert, *Jepson* 15,867; Ord Mt., Mohave Desert, *Jepson* 15,495; McCoy Wash, e. Riverside Co., *Hall* 5925; Fort Yuma, *Jepson* 11,729; Pilot Knob, *J. Grinnell*.

Refs.—MENTZELIA MULTIFLORA Gray, Mem. Am. Acad. n. ser. 4:48 (1849); Jepson, Man. 651 (1925). *Bartonia multiflora* Nutt. Jour. Acad. Phila. n. ser. 1:180 (1848), type loc. Santa Fe, *Gambel*. *Touterea multiflora* Rydb. Bull. Torr. Club 30:277 (1903). *Nuttallia multiflora* Greene, Lflts. 1:210 (1906). *M. pumila* var. *multiflora* Urb. & Gilg, Nova Acta Acad. Nat. Cur. 76:93 (1900). *M. wrightii* Parish, Zoe 4:163 (1893); probably not M. wrightii Gray (1849).

3. **M. leucophylla** T. Bdg. White Stick-leaf. Stems several from a biennial root, erect, 10 to 18 inches high; leaf-blades oblong, shallowly repand-dentate or -denticulate, narrowed below to a short mostly winged petiole, 1 to 2 inches long, the cauline similar and sessile, the uppermost cauline sessile-auriculate, all more or less whitened with a dense covering of short hairs; branches of the inflorescence few and more or less divaricate; calyx-lobes lanceolate, attenuate, closely reflexed in anthesis; petals pale yellow, 5 to 5½ lines long, narrowly obovate with a broad claw; ovary purplish or with a transverse purple band at summit; capsule 3 to 4 lines long, 3 to 3½ lines wide; seeds flat, margined by a border less than ¼ line wide.

Gravelly washes in arid cañons, 3800 to 4200 feet: eastern Inyo Co. East to southern Nevada. May.

Locs.—Mazourka Cañon, Inyo Mts., *Duran* 3467; Emigrant Cañon, *Jepson* 7112; Hanaupah Cañon, *Jepson* 7077.

Ref.—MENTZELIA LEUCOPHYLLA T. Bdg. Bot. Gaz. 27:448 (1899), type loc. Ash Mdws., Nev., *Purpus* 6032. The leaves in the plants of Purpus are very white with a close felt-like covering. The Death Valley specimens are less pubescent, but otherwise agree well with the type from Nevada.

4. **M. torreyi** Gray. Lava Stick-leaf. Stems caespitose, densely branched, 3 to 6 inches high; branches chalk-white in age; herbage hispidulose or scaberulous; leaf-blades very narrow with 1 to 3 pairs of acute or lanceolate lobes, the margins revolute; floral leaves narrowly linear-acuminate, entire or with 1 pair of lanceolate lobes, ¾ to 1 inch long; flowers solitary, sessile in the forks and axils; calyx-lobes subulate, 1 to 1¾ lines long, united at base into a tube 1 line long, erect in fruit; petals oblanceolate, pale yellow, 4 to 5 lines long; stamen-filaments all filiform; capsule ovate, 2 to 3 lines long, crowned by the calyx and a little constricted beneath it, thus somewhat jug-shaped in outline; seeds 4 or 5, oblong, truncate at apex, subacute at base, 5-angled, slightly rugulose, 1 line long.

Rocky volcanic plains, 4000 to 6500 feet: Mono Co. East to Nevada. July-Aug.

Locs.—Volcanic table-land (north part), Mono Co., *Peirson* 752; Mono Lake (n. shore), *Peirson* 9200.

Ref.—MENTZELIA TORREYI Gray, Proc. Am. Acad. 10:72 (1874), type loc. Humboldt Co. plains, Nev., *Torrey*.

5. **M. involucrata** Wats. SAMIJA. Stems branching, with very white bark, 3 to 24 inches high; herbage hispid with stiff hairs; leaf-blades linear to oblong-lanceolate or -oblanceolate, coarsely sinuate-dentate, 2 to 6½ inches long, the lower attenuate into a petiole, the upper sessile and clasping; flowers solitary, terminal, closely subtended by a pair of broad white scarious bracts with deeply laciniate-toothed green margin; petals obovate, abruptly acuminate, light straw-color with a satiny sheen, a tinge of crimson in center, (¾ or) 1 to 2½ inches long; stamens numerous, slender, ½ as long as the petals, the outer dilated above and continued with a long cusp on each side of the anther; capsule 9 to 12 lines long, 3 lines broad at apex; seeds irregularly oval or roundish-quadrangular, rugulose and minutely granular.

Sandy or gravelly washes and rocky cañon sides, –50 to 800 feet: Colorado Desert. East to Arizona, south to Mexico. Feb.-Apr.

Locs.—Eagle Mts., *Munz & Keck* 4940; Cottonwood Spr., Cottonwood Mts., *Jepson* 12,552; Dos Palmos Spr., *Munz* 9951; Mecca Hills, *Jepson* 11,646; Coral Reef Cañon, Coachella, *Clary* 1596; Whitewater, *Jepson* 11,620; betw. Piñon Well and County Well, *Jepson* 6009; Palm Cañon of San Jacinto, *Jepson* 1353; Borrego Spr., *Jepson* 8882; Signal Mt., *T. Brandegee;* Coyote Wells, *Newlon* 390.

Refs.—MENTZELIA INVOLUCRATA Wats. Proc. Am. Acad. 20:367 (1885), type loc. San Bernardino Co., *Parry;* Jepson, Man. 649 (1925). *Bicuspidaria involucrata* Rydb. Bull. Torr. Club 30:275 (1903). *Nuttallia involucrata* Dav. & Mox. (by error "Watson"), Fl. S. Cal. 240 (1923). *M. involucrata* var. *megalantha* Jtn. Univ. Cal. Publ. Bot. 7:443 (1922), type loc. near Salton, Riverside Co., *Hall* 5839. *Nuttallia involucrata* var. *megalantha* Dav. & Mox. (by error "Munz & Jtn."), Fl. S. Cal. 240 (1923).

6. **M. peirsonii** Jepson sp. n. (Fig. 248.) Stem diffusely and repeatedly branched from the base, 6 to 11 inches high; leaf-blades ovate, 1 to 1½ inches long, sinuately and saliently few-toothed with lanceolate teeth, sessile or subcordately clasping, the lower or basal oblong and petioled; calyx-lobes 6 to 7 lines long; petals obovate, acuminate or acute, pale yellow-slate color, 8 to 9 lines long; 2 or 3 outer rows of filaments linear, the anthers set in a notch at apex; capsules linear, 10 to 12 lines long, 2¼ to 2½ lines wide.—(Caules basi diffuse, iteratim ramosi, unc. 6–11 alti; folia ovata, unc. 1–1½ longa, sinuate et saliente paucidentata dentibus lanceolatis, sessilia vel subcordate amplexicaulia, inferiora oblongata, petiolata; calycis lobi lin. 6–7 longi; petala obovata, acuminata vel acuta, palliflaventia, lin. 8–9 longa; verticillorum exteriorum filamenta linearia apice serrata; capsulae lineares, lin. 10–12 longae, lin. 2¼–2½ latae.)

Sandy washes, 800 feet: west side of Colorado Desert in southwestern Imperial Co. Apr.

Loc.—Myers Creek bridge, foot of Mountain Springs grade, *Jepson* 11,764 (type), *F. W. Peirson.*

7. **M. tricuspis** Gray. DESERT STICK-LEAF. Stems branching from or near the base, 3 to 10 inches high; herbage hispidulous; leaf-blades narrow-oblong to ovate or oblanceolate, saliently toothed or serrate to subentire, 1 to 2 inches long, attenuate at base into a short petiole; flowers terminal on short branches; calyx lobes filiform-subulate from a triangular base, becoming involute and caudiform-rotate or reflexed after anthesis, (2½ or) 4½ to 7 lines long; petals light yellow-slate color, narrow-obovate, sharply apiculate, 6 to 10 lines long; stamens in 4 or 5 rows, the 2 outer rows with dilated filaments, the anthers borne on a short filiform prolongation in the acutely notched apex; capsule oblong, hirsute, papillate-tesselated, 5 to 6 (or 11) lines long, 2 to 2½ lines wide, in age reflexed; seeds broadly oblong, rugose, and with 2 or 3 deep narrow irregular channels or folds, 1 line long.

Stony hills, 200 to 3200 feet: eastern Mohave Desert. East to Nevada and Arizona. Apr.

Locs.—Yermo, *Jepson* 15,867a; Barstow, *Jepson* 5828; Old Woman Sprs., s. Mohave Desert, *Jepson* 5951; Needles (Dav. & Mox. Fl. S. Cal. 240).

Refs.—MENTZELIA TRICUSPIS Gray, Am. Nat. 9:271 (1875), type loc. s. of St. George, s. Utah, comm. *C. C. Parry;* Jepson, Man. 649 (1925). *Bicuspidaria tricuspis* Rydb. Bull. Torr. Club 30:275 (1903). *Nuttallia tricuspis* Dav. & Mox. (by error, "Greene"), Fl. S. Cal. 240 (1923). *Mentzelia tricuspis* var. *brevicornuta* Jtn. Univ. Cal. Publ. Bot. 7:444 (1922), type loc. Barstow, San Bernardino Co., *K. Brandegee. Nuttallia tricuspis* var. *brevicornuta* Dav. & Mox. (by error, "Munz & Jtn."), Fl. S. Cal. 240 (1923).

8. **M. reflexa** Cov. PANAMINT STICK-LEAF. Stems stout, diffusely branching from the base, 5 to 8 inches high; herbage hirsute; leaf-blades ovate, coarsely dentate, ¾ to 1¼ inches long, shortly petioled or sessile; flowers solitary in the upper forks; calyx-lobes subulate from a triangular base, 2 to 2½ lines long; petals about 8, oblong-oblanceolate, equaling the calyx-lobes; stamens 9 to 13; filaments somewhat dilated; capsule oblong, 3½ to 5½ lines long, its pedicel reflexed at apex; seeds angular, somewhat compressed, grooved on either face, muriculate.

Arid hills and valleys, –280 to 4000 feet: Inyo Co.; eastern Mohave Desert. Apr.-May.

Locs.—Salt Flat, Death Valley, *J. Grinnell;* Salt Spr., Death Valley, *Parish* 10,063; Hall Cañon, Panamint Range (Contrib. U. S. Nat. Herb. 4:108); Bradbury Well, Black Mts., *J. T. Howell* 3606; Calico, Calico Mts. (Bot. Gaz. 65:339).

Refs.—MENTZELIA REFLEXA Cov. Proc. Biol. Soc. Wash. 7:74 (1892), type loc. Surprise Cañon, Panamint Mts., *Coville & Funston* 709; Jepson, Man. 652 (1925).

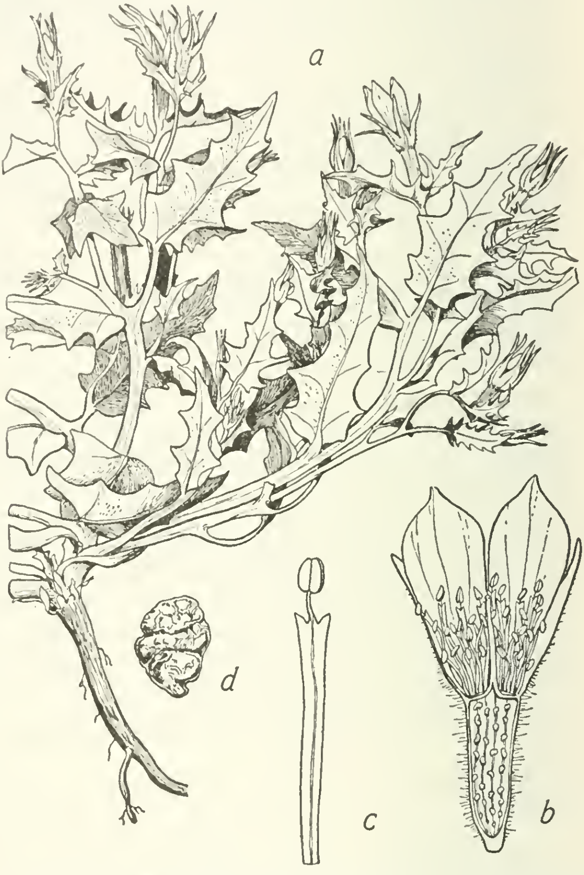

Fig. 248. MENTZELIA PEIRSONII Jepson. *a*, habit, × ½; *b*, long. sect. of fl., × 1½; *c*, outer stamen, × 4; *d*, seed, × 6.

9. **M. micrantha** T. & G. SAN LUIS STICK-LEAF. Stems branched from the base, 1 to 3 feet high, sometimes compactly dichotomous and forming low mounds 1 to 2 feet broad; herbage rough-hispid, at least above; leaf-blades ovate to lanceolate, acute or acuminate, coarsely serrate or sinuate-toothed, 1 to 5 inches long, the basal 5 to 10 inches long, the uppermost roundish, entire, 2 to 6 lines long; flowers congested in very compact clusters, very small, shorter than or scarcely exceeding the short broad floral leaves; petals oval or obovate, 1½ to 2 lines long, twice as long as the calyx-lobes; stamens 10 to 12, 5 of the filaments (opposite the sepals) petal-like, usually with emarginate apex; capsule linear, sharply triangular, 3 lines long, 1 to 1¼ lines wide; seeds prismatic with grooved angles, 1 line long, twice as long as broad.

Dry chaparral slopes and cañons, 600 to 3500 feet: Coast Ranges from Colusa Co. to San Luis Obispo Co.; south to the San Bernardino and Santa Ana mountains. Apr.-June.

Locs.—Eppersons, w. Colusa Co., *Curran;* Clear Lake, *Torrey;* Mt. Diablo, *Jepson* 8331; Willow Creek, Santa Lucia Mts., *Eastwood;* Lopez Cañon, San Luis Obispo Co., *Condit;* Santa Barbara, *Bingham;* Los Alisos Cañon, Santa Monica Mts., *Epling;* Santa Catalina Isl. (Erythea 7:140); Rubio Cañon, San Gabriel Mts., *Peirson* 119; North Fork San Gabriel Cañon, *Peirson* 2465; Cajon Cañon, *Jepson* 6094; Claymine Cañon, Santa Ana Mts., *J. T. Howell* 2642.

Refs.—MENTZELIA MICRANTHA T. & G. Fl. 1:535 (1840); Jepson, Fl. W. Mid. Cal. 322 (1901), ed. 2, 268 (1911), Man. 650, fig. 643 (1925). *Bartonia micrantha* H. & A. Bot. Beech. 343, t. 85 (1840), type from Cal., *Douglas. Acrolasia micrantha* Rydb. Bull. Torr. Club 30:278 (1903). *A. micrantha* var. *stricta* Dav. Bull. S. Cal. Acad. 5:15 (1906), type loc. Ojai, Ventura Co., *F. W. Hubby* 67 (segregated upon strict habit and symmetrically toothed leaves).

10. **M. dispersa** Wats. NADA STICK-LEAF. Stems usually branching, 8 to 18 inches high; herbage minutely pubescent; leaf-blades oblong to ovate, lanceolate or linear, entire or sometimes toothed, ½ to 4 inches long; flowers approximate near the ends of the branches; petals yellow with a small orange spot at base, elliptic or obovate, 1 to 2 (or 2½) lines long; stamens 12 to 14; filaments not dilated; capsule linear, 4 to 10 lines long, ½ to 1 line wide; seeds ½ line long.

Arid plains and dry mountain slopes, 50 to 6300 feet: almost throughout California. East to Arizona and Colorado, north to British Columbia. June-Aug.

Note on variation.—This group of plants, Mentzelia dispersa, while imperfectly segregated from M. affinis, is a recognizable natural unit, but the same cannot be said of the named segregates of the group. The stems are naked below to very leafy; the leaves are markedly different in size and vary in shape from narrowly linear and entire to broad and several-toothed with every gradation between; the petals range from 1 to 2½ lines; the capsules vary in length and the calyx-lobes vary in shape and length. Several groups of plants could be segregated upon these features but would have no constant characters and in most cases little or no geographic significance.

Locs.—S. Cal.: Fort Yuma, *Jepson* 11,735; Laguna Mts., *T. Brandegee;* Conchilla Desert, *Jepson* 6056; Strawberry Valley, San Jacinto Mts., *Hall* 2272; Trail Fork, San Gabriel River, *Peirson* 2466; Mt. Wilson, San Gabriel Mts., *Geo. B. Grant;* Mt. Pinos, Ventura Co., *Hall* 6664. Coast Ranges: Stone Cañon, Monterey Co., *Condit;* Mt. Diablo, *Greene;* Lower Lake grade, Lake Co., *Jepson;* Potter Valley, Mendocino Co., *Purpus;* South Yollo Bolly, *Jepson* 14,043; Yreka, *Butler* 1026. Sierra Nevada: Lloyd Mdws., Tulare Co., *Jepson* 4877a; Horse Corral Mdw., South Fork Kings River, *Jepson* 767; Simpson Mdw., Middle Fork Kings River, *Henrietta Eliot;* Pine Ridge, Fresno Co., *K. Brandegee;* Wawona (Clarks), Mariposa Co., *Bolander* 4863; Bowers Cave, Mariposa Co., *Jepson* 14,042; Lake Merced, Mariposa Co., *Jepson* 4427; Hetch-Hetchy, *A. L. Grant* 837; Sugar Pine, Tuolumne Co., *Chesnut & Drew;* Kennedy Mdw., Tuolumne Co., *A. L. Grant* 453; Angels Camp, *Davy* 1470; Tahoe, *L. S. Smith* 1651; Truckee, *Sonne;* Dog Valley, e. Nevada Co., *Jepson* 14,044; Beckwith Pass, Lassen Co., *Jepson* 7773; Mt. Bidwell, Modoc Co., *Manning* 159.

Plants with slender shining stems, few-leaved and with long internodes, represent the more arid aspect published as M. pinetorum Hel. However, the characters originally utilized to segregate this form are not constantly associated. The var. OBTUSA Jepson (upper leaves usually many, disposed to be orbicular or round-ovate, often very obtuse, 3 to 5 lines long) is mostly limited to the San Gabriel, San Bernardino and San Jacinto mountains (3000 to 7500 feet) and represents a geographic phase usually found at a higher altitude than the species.

Refs.—MENTZELIA DISPERSA Wats. Proc. Am. Acad. 11:137 (1876); Jepson, Fl. W. Mid. Cal. 322 (1901), ed. 2, 268 (1911), Man. 651, fig. 644 (1925). *M. albicaulis* var. *integrifolia* Wats. Bot. King 114 (1871), type loc. e. Humboldt Mts., Nev., *Watson* 430. *M. integrifolia* Rydb. Mem. N. Y. Bot. Gard. 1:271 (1900). *Acrolasia integrifolia* Rydb. Bull. Torr. Club 30:278 (1903). *M. albicaulis* var. *genuina* Urb. & Gilg, Nova Acta Acad. Nat. Cur. 76:28 (1900), in part. *Acrolasia dispersa* Dav. (by error "Wats."), Bull. S. Cal. Acad. 5:14 (1906). *A. albicaulis* var. *integrifolia* Daniels, Fl. Boulder, Colo. 174 (1911). *A. latifolia* Rydb. Bull. Torr. Club 31:567 (1904), type loc. mountains between Sunshine and Ward, Colo., *Tweedy* 5149. *M. latifolia* Nels.; Coult. & Nels. Man. 324 (1909). *M. dispersa* var. *latifolia* Mcbr. Contrib. Gray Herb. 76:26 (1918). *M. pinetorum* Hel. Bull. S. Cal. Acad. 2:69 (1903), type loc. Mt. Sanhedrin, Lake Co., *Heller* 5910. *Acrolasia pinetorum* Hel. Muhl. 2:99 (1905). *M. dispersa* var. *pinetorum* Jepson, Man. 651 (1925). Var. OBTUSA Jepson, Man. 651 (1925), type loc. San Bernardino Mts., *Chandler.*

11. **M. affinis** Greene. HYDRA STICK-LEAF. Stem stoutish, branched from the base or simple below, 1 to 1½ (or 3) feet high; herbage harsh-puberulent; leaf-blades lanceolate or ovate in outline, deeply and often sharply pinnatifid, 1 to 2 (or 3½) inches long; flowers numerous but not congested; calyx-lobes subulate,

1 to 2 lines long; petals yellow, often fading whitish, 2½ to 3 lines long; capsule linear, subterete, 9 to 11 lines long, ¾ to 1 line wide, hispid with short stiff white hairs; seeds very short-prismatic, somewhat irregularly or obliquely truncate at each end, with grooved angles.

Open hill slopes and plains, 25 to 5000 feet: inner South Coast Range; San Joaquin Valley; south through the Mohave Desert to the San Jacinto Range and its bordering valleys. South to Lower California, east to Arizona. Mar.-May.

Variation note.—Mentzelia affinis very closely simulates certain phases of M. albicaulis and, with certainty, is distinguishable only by the characters of the mature seed. In the San Joaquin Valley it is probably an introduction from Southern California since the period of American occupation. In 1889 it appeared at Sanders, Fresno Co., and by 1898 had become a troublesome weed in wheat fields (Erythea 1:158), attaining a height of three feet.

Locs.—San Joaquin Valley: Antioch, *Davy* 918; Tracy, *C. F. Baker* 2781; betw. Mossdale School and Atlanta, San Joaquin Co., *Jepson* 14,045; Tipton, Tulare Co., *Jepson* 11,594; Delano, Kern Co., *Julia A. Bettys;* Bakersfield, *Davy* 1742. Inner South Coast Range: San Carlos Creek, *Jepson* 2732; Zapato Chino Creek, sw. Fresno Co., *Jepson* 15,389; Elkhorn Scarp, se. San Luis Obispo Co., *Jepson* 16,227. Tehachapi Mts.: Keene, *MacFadden.* S. Cal.: Barstow, *Jepson* 5833; San Bernardino, *Parish;* Riverside, *Jepson* 1234; Hemet, *C. F. Baker* 4141; Cathedral Cañon, Palm Sprs. of San Jacinto, *Hall* 5766.

Refs.—MENTZELIA AFFINIS Greene, Pitt. 2:103 (1890), type loc. Lathrop, San Joaquin Co.; Jepson, Fl. W. Mid. Cal. 322 (1901), ed. 2, 268 (1911), Man. 651 (1925). *Acrolasia affinis* Rydb. Bull. Torr. Club 30:278 (1903). *M. albicaulis* var. *veatchiana* Urb. & Gilg, Nova Acta Acad. Nat. Cur. 76:28 (1900) in part. *Acrolasia viridescens* Hel. Muhl. 2:98 (1905), type loc. Kern, Kern Co., *Heller* 7604.

12. **M. congesta** T. & G. VENTANA STICK-LEAF. Stems branching from near the base, 4 to 26 inches high; herbage hispidulous; leaf-blades ovate to lanceolate, pinnatifid or coarsely few-toothed, 1 to 2½ inches long, sessile or the lower shortly petioled; flowers clustered at the ends of the branches, subtended by conspicuous bracts; bracts broad, toothed, 4 to 6 lines long, with a large circular white-membranous center; calyx-lobes ¾ to 1½ lines long; petals golden-yellow, 3 to 6 lines long; filaments all filiform; capsule clavate, 4 to 6 lines long, 1 line wide; seeds irregularly angled, minutely tuberculate, ½ to ¾ line long.

Washes, cañons or mountain valleys, 4000 to 9000 feet: east side and high easterly cañons or valleys of the Sierra Nevada from Inyo Co. to Sierra Co. East to Nevada, north to Oregon. June-July.

Locs.—Argus Peak, Inyo Co., *Purpus* 5475; Lloyd Mdws., Tulare Co., *Jepson* 4897; Volcano Creek, *Jepson* 964; Bishop, *Almeda Nordyke;* Mammoth, Mono Co., *K. Brandegee;* Bubbs Creek, Fresno Co., *Jepson* 783; Mono Lake, *Ottley* 1054; Dog Creek Cañon, Sierra Co., *Sonne.* Nev.: Glenbrook, w. Washoe Co., *K. Brandegee.*

Var. **davidsoniana** Mcbr. Much less branched; leaf-blades mostly entire; flower clusters smaller; calyx-lobes about half as large; bracts narrower, oblanceolate or spatulate, entire above or shallowly toothed, 4 to 4½ lines long.—Montane ridges and flats: San Jacinto and San Gabriel mountains; Sierra Nevada in Tulare Co.

Locs.—Onstatts Valley, San Jacinto Mts., *Hall* 2225; Rock Creek, San Gabriel Mts., *Peirson* 472; Bonita Mdw., Tulare Co., *Hall & Babcock* 5203.

Refs.—MENTZELIA CONGESTA T. & G. Fl. 1:534 (1840), type loc. "Rocky Mts. on Lewis River", *Nuttall;* Jepson, Man. 650 (1925). *Trachyphytum congestum* Nutt.; T. & G. l.c., as synonym. *Acrolasia congesta* Rydb. Bull. Torr. Club 30:277 (1903). Var. DAVIDSONIANA Mcbr. Contrib. Gray Herb. 56:28 (1918). *Acrolasia davidsoniana* Abrams, Bull. Torr. Club 32:538 (1905), type loc. Mt. Wilson, Los Angeles Co., *Abrams* 2580. *M. davidsoniana* Abrams, Fl. Los Ang. ed. 2, 235 (1917).

13. **M. lindleyi** T. & G. GOLDEN BARTONIA. Stem slender, simple or branching, 6 inches to 2 feet high; leaf-blades ovate to narrowly lanceolate, pectinately pinnatifid with entire or toothed lobes, or coarsely toothed, 2 to 3 inches long; flowers axillary and terminal; calyx-lobes 5 to 9 lines long, broadly lanceolate, acuminate; petals obovate, abruptly acute, golden yellow with vermilion base, 9 to 15 lines long; stamens numerous, about ¾ as long as the petals; filaments very slender, about 15 of the outer ones with somewhat dilated bases; capsule linear-

clavate, 1 to 1¼ inches long, 1 to 2 (or 3) lines wide; seeds roundish or obovoid, irregularly angled, microscopically tesselate, 1 to 1½ lines long.

Cañon sides and rocky hill slopes, 500 to 4200 feet: Mt. Hamilton Range; Sierra Nevada foothills from Tuolumne Co. to Tulare Co. Mar.-July.

Locs.—Mt. Hamilton Range: Morrison Cañon, Niles, *Jepson* 14,046; Mt. Day, *R. J. Smith;* Los Buellis Hills, *R. J. Smith;* Mt. Hamilton, *Pendleton* 883. Sierra Nevada foothills: Duck Bar, Stanislaus River, *A. L. Grant* 721; Shawmut, Tuolumne Co., *Chas. Lyser;* Hennedey ranch, s. Mariposa Co., *J. B. Lembert;* North Fork Kaweah River, *Jepson* 576; Tule River, *Purpus* 1545.

Refs.—MENTZELIA LINDLEYI T. & G. Fl. 1:533 (1840); Jepson, Fl. W. Mid. Cal. 323 (1901), ed. 2, 268 (1911), Man. 649, fig. 642 (1925). *Bartonia aurea* Lindl. Bot. Reg. t. 1831 (1836), type cult., seeds from Cal., *Douglas. Creolobus aureus* Lilja, Fl. Sver. 67 (1839). *Chrysostoma aurea* Lilja, Fl. Sver. Suppl. 1:33 (1840). *M. aurea* Baill. Hist. Pl. 8:461, figs. 309–311 (1886); Urb. & Gilg, Nova Acta Acad. Nat. Cur. 76:32, t. 2, figs. 1–11 (1900); not M. aurea Nutt. (1818). *Acrolasia aurea* Rydb. Bull. Torr. Club 30:278 (1903). *M. bartonia* Steud. Nomencl. ed. 2, 2:128 (1841). *M. crocea* Kell. Proc. Cal. Acad. 7:110 (1877), collected by Eisen, type loc. not stated, probably Sierra Nevada foothills in Fresno Co

14. **M. gracilenta** T. & G. BUCKAROO PENNY. Stem mostly green or greenish, sparingly branched or often simple, rather leafy, ⅓ to 1½ feet high; leaf-blades narrowly oblong in outline, pinnatifid into broadly linear lobes or only coarsely sinuate-toothed; blades of upper leaves sometimes disposed to be ovate or lanceolate, somewhat sharply cleft or entire; flowers clustered at the summit; petals yellow with orange base, obovate or oblanceolate, rounded or retuse at apex, 4 to 7 lines long; filaments dilated and somewhat united at base; capsule linear-clavate, 6 to 10 lines long, 1 line wide; seeds in 3 rows, prismatic, minutely tuberculate, usually grooved on one angle, ⅔ line long.

Valley plains and hill slopes, 500 to 5000 feet: Marysville Buttes; coastal region from Monterey Co. to Riverside Co.; east to the Tehachapi Mts. East to Arizona, south to Lower California. Mar.-July.

Note on variation.—The rather leafy coastal form with greenish pubescent stems, narrow pinnately divided leaves and large flowers may be taken to represent the original of this species. Divergence from this condition takes place in several directions. The stems may be glabrous, white and shining with long internodes and few leaves; there exist both large-flowered and small-flowered phases; also there is much variation in leaf shape. In general the capsules are broader than in M. albicaulis but intermediates between these two species are so common that the specific distinction is retained mostly upon practical considerations, since the extremes of the group are dissimilar in aspect and widely distinct in range.

Locs.—Marysville Buttes: South Peak, *Jepson* 14,047. South Coast Ranges: San Antonio Creek, Monterey Co., *Brewer* 575; Paso Robles, *Barber* 917. Coastal S. Cal.: Saugus, *K. Brandegee;* Playa del Rey, *Braunton* 866; Pomona, *Braunton* 219; Strawberry Valley, Mt. San Jacinto, *Hall* 1121.

Var. **nitens** Jepson comb. n. Stems glabrous, very slender, shining, white or flesh-color; internodes long; leaves few, remote, their blades linear or linear-lanceolate, typically entire or rather remotely toothed (or deeply pinnatifid); petals 3 to 6 (or 8) lines long; capsules linear-clavate, ½ to 1 inch long, 1 to 1½ lines wide.—Desert washes, 750 to 4000 feet: Colorado Desert, mountains on north side; Mohave Desert and its bordering ranges; Inyo and Mono Cos.; upper San Joaquin Valley; in less typical form in San Luis Obispo and San Benito Cos. East to Nevada. Apr.-July.

Locs.—Eagle Mts., Riverside Co., *Munz & Keck* 4955; Victorville, *Peirson* 7756; Arrastre Creek, n. side San Gabriel Mts., *Peirson* 395; Kane Sprs. wash, *Jepson* 15,531; Searles sta., *Wheeler & Richardson* 72; Homewood Cañon, Argus Mts., *Wheeler & Richardson* 104; Lone Pine, Inyo Co., *K. Brandegee;* Bishop, *Almeda Nordyke;* Pickle Mdw., Mono Co., *Ottley* 1122; Bakersfield, *Davy* 1715. In the following the stems are puberulent and more leafy, with the leaves usually deeply pinnatifid, in these respects looking toward the species: Vancouver Pinnacles, San Benito Co., *Hall* 9961; Paso Robles, *Barber;* Atascadero, *Brewer* 506; Olcese ranch, Poso Creek, Kern Co., *Allison Krames;* Silver Cañon, White Mts., *K. Brandegee;* Cottonwood Pass, n. side Colorado Desert, *Hall* 6002.

Var. **eremophila** Jepson comb. n. Stems less leafy, glabrous, white and shining; leaves sometimes few-toothed or entire; petals ½ to 1 inch long, often with a very slight acumination.—Desert mesas and arid hills, 2200 to 3800 feet: Temblor Range; northern Mohave Desert; Inyo Co.

Locs.—Elkhorn Scarp, se. San Luis Obispo Co., *Jepson* 16,229; Randsburg, *Heller* 7692; Searles sta., *Wheeler & Richardson;* Big Pine.

Refs.—MENTZELIA GRACILENTA T. & G. Fl. 1:534 (1840), type from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. 323 (1901), ed. 2, 268 (1911), Man. 652 (1925). *Acrolasia gracilenta* Rydb. Bull. Torr. Club 30:278 (1903). *M. albicaulis* var. *gracilenta* Wats. Bot. King 114 (1871). *M. pectinata* Kell. Proc. Cal. Acad. 3:40, fig. 9 (1863), type loc. hills above Visalia, *Hutchings*. *Acrolasia pectinata* Rydb. Bull. Torr. Club 30:278 (1903). *M. albicaulis* var. *pectinata* Urb. & Gilg, Nova Acta Acad. Nat. Cur. 76:29 (1900). *M. gracilenta* var. *pectinata* Jepson, Man. 652 (1925). *Acrolasia catalinensis* Millsp. Field Mus. Publ. Bot. 5:177 (1923), type loc. Avalon, Santa Catalina Isl., *R. L. Pendleton* 1363 (ex char.). Var. NITENS Jepson. *M. nitens* Greene, Fl. Fr. 234 (1891), type loc. near Benton, Mono Co., *Shockley*. *Acrolasia nitens* Rydb. Bull. Torr. Club 30:278 (1903). Var. EREMOPHILA Jepson. *M. lindleyi* var. *eremophila* Jepson, Man. 650 (1925), type loc. Big Pine, Inyo Co., *Hall & Chandler* 6680.

15. **M. albicaulis** Dougl. KUHA. Stem slender, branched from the base, 3 to 12 (or 15) inches high; herbage rough-hispidulose, or the stems glabrous, commonly very white; leaf-blades linear-lanceolate, sessile, entire to deeply pinnatifid, or sometimes, especially the upper, broader, ovate or broadly oblong and entire or shallowly toothed, 1 to 4½ inches long; flowers in terminal cymes; bracts oblong, ovate or spatulate, entire or few-toothed, usually small in proportion to the capsule; calyx-lobes a little shorter than the petals; petals yellow, spatulate or obovate, 1½ to 3½ lines long; filaments all filiform; capsule linear-clavate, 6 to 9 lines long; seeds irregularly angled with obtuse margins, microscopically but markedly muriculate, ⅓ line long.

Mesas and cañons, 2000 to 7400 feet: east side of the Sierra Nevada from Nevada Co. to Inyo Co.; Mohave and Colorado deserts. South to Lower California, east to Colorado, north to eastern Washington. Mar.-July.

Note on variation.—In this group the variation in leaves and floral structures is so extreme that it is exceedingly difficult to delimit Mentzelia albicaulis as a species. The original plant of Douglas has lanceolate deeply sinuate-pinnatifid leaves, flowers solitary or in loose clusters, "not bracteolate", petals about two lines long. The California plants, although rarely agreeing closely with this description, may properly be regarded as conspecific. Leaves vary from lanceolate and pinnatifid to broadly ovate and entire or shallowly few-toothed, or to linear and entire, and there is often great variation upon a single plant (Black Cañon, White Mts., *Duran* 550). The foliaceous bracts, usually not concealing the capsules to any extent, sometimes become more prominent (Hunters ranch, *Hall & Chandler* 7140), thus approaching very nearly M. congesta. The petal length varies from 1½ lines to 3½ lines. Characters are so inconstant for the group that larger-flowered forms are only arbitrarily referred to M. gracilenta var. nitens. The capsules, typically few in loose clusters and narrowly long-cylindrical, are sometimes broader and shorter (the form A. montana Dav.), or more congested and proportionately broader (Adelanto, *Parish* 11,819), as in the form M. veatchiana Kell. Occasionally, as in the form Acrolasia desertorum Dav., the seeds from the upper broader portion of the capsule are irregularly angled, while those from the lower narrower portion are regularly prismatic with grooved angles.

Locs.—East side of Sierra Nevada or its easterly valleys: Truckee, *Sonne;* Mono Lake, *Ottley* 1054a; Bishop, comm. *W. A. Chalfant;* Lloyd Mdws., Tulare Co., *Jepson* 4904; Argus Peak, Inyo Co., *Chandler* 6899; Hanaupah Cañon, Panamint Range, *Jepson* 6979. Mohave Desert and bounding ranges: Lavic, *J. Grinnell;* Yermo, *Jepson* 15,871; Barstow, *Jepson* 5390; Kramer, *Jepson* 5347; Amargo, *Jepson* 15,576; Mt. Pinos, *Hall* 6577; Mt. Markham, San Gabriel Mts., *Peirson* 120. Colorado Desert: Cottonwood Spr., Cottonwood Mts., *Jepson* 12,606; Coachella, *Schellenger;* Borrego Spr., *Jepson* 8879; Wagon Wash, near Sentenac Cañon, *Jepson* 8946; Box Cañon, Blair Valley, e. San Diego Co., *Jepson* 8652; Vallecito, *Jepson* 8601. The following have the rather broad capsules in dense clusters (as in the original M. veatchiana but with narrower more pinnatifid leaves): Bishop, *K. Brandegee;* Kernville, *T. Brandegee;* Tehachapi Peak, *Dudley* 350; Lancaster, *K. Brandegee;* Signal Mt., Colorado Desert, *T. Brandegee*.

Refs.—MENTZELIA ALBICAULIS Dougl.; Hook. Fl. Bor. Am. 1:222 (1834), type loc. Columbia River, *Douglas*, as synonym; Jepson, Man. 651 (1925). *Bartonia albicaulis* Dougl.; Hook. l.c. *M. albicaulis* var. *genuina* Urb. & Gilg, Nova Acta Acad. Nat. Cur. 76:28 (1900). *Acrolasia albicaulis* Rydb. Bull. Torr. Club 30:277 (1903). *M. veatchiana* Kell. Proc. Cal. Acad. 2:99, fig. 28 (1863), type loc. Virginia City, Washoe Co., Nev., *Veatch*. *Acrolasia veatchiana* Rydb. Bull. Torr. Club 30:278 (1903). *M. albicaulis* var. *veatchiana* Urb. & Gilg, Nova Acta Acad. Nat. Cur. 76:28 (1900). *M. gracilenta* var. *veatchiana* Jepson, Man. 652 (1925). *Acrolasia montana* Dav. Bull. S. Cal. Acad. 5:18 (1906), type loc. Mt. Pinos, Ventura Co., *Hall* 6511. *A. desertorum* Dav. l.c. 5:12, type loc. Signal Mt., Colorado Desert, *T. Brandegee*.

2. **EUCNIDE** Zucc.

Herbs or bushes armed with stinging hairs and barbed pubescence. Leaves alternate, their blades ovate, petioled, coarsely toothed. Flowers yellow, pediceled, mostly in terminal bracted cymes. Calyx-limb 5-lobed, persistent. Petals 5, united at base and inserted on the throat of the calyx. Stamens numerous, the filaments filiform, inserted on the base of the petals in a broad band and deciduous with them in a ring. Placentae 5, prominently expanded, covered with ovules; style 5-cleft, the lobes often twisted. Capsule obovate, opening by 5 valves at the summit. Seeds minute, longitudinally striate.—Species 8, southwestern United States and Mexico. (Greek eu, true, and cnide, sea-nettle.)

1. **E. urens** Parry. Rock Nettle. Low bush 1 to 2 feet high, the stout stems erect-spreading, or often all decumbent and 2 to 5 feet long; herbage finely puberulent and covered with 2 kinds of bristles, simple and barbed; bristles on upper surface of leaves with broad disks at base; leaf-blades broadly ovate, 1 to 2½ inches long; pedicels 3 to 6 lines long; calyx-lobes lanceolate, 6 to 10 lines long; petals narrowly obovate, abruptly acuminate, 1½ inches long, united at the base into a tube 3 lines long; filaments equaling the calyx-lobes; style stout, cleft to the middle, the cleft portion twisted; capsule ½ inch long.

Shade of cliffs or in rocky places, 2000 to 3000 feet: Inyo Co. East to Utah, thence south to Lower California. May.

Locs.—Inyo Mts. (Contrib. U. S. Nat. Herb. 4:109); Surprise Cañon, Panamint Range, *Parish* 10,422; Funeral Mts., *Jepson* 6890; Grotto Cañon, Death Valley, *Hoak & Thacher;* Argus Mts., *Purpus;* Slate Range, *Chandler.*

Refs.—Eucnide urens Parry, Am. Nat. 9:144 (1875); Jepson, Man. 652, fig. 645 (1925). *Mentzelia urens* Gray, Proc. Am. Acad. 10:71 (1874), type loc. Colorado River near mouth of Williams River, w. Ariz., *Bigelow.*

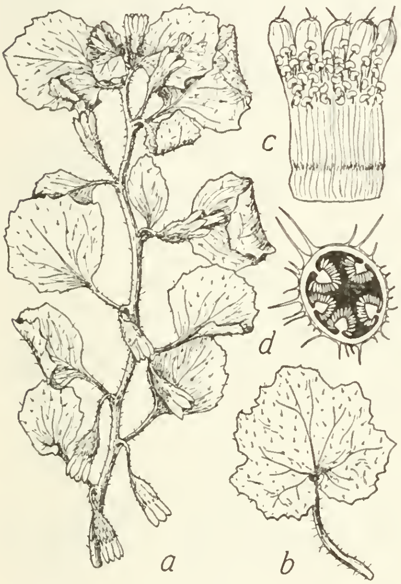

Fig. 249. Sympetaleia rupestris Gray. *a*, flowering branch, × ½; *b*, basal leaf, × ½; *c*, corolla spread open, × 2; *d*, cross sect. of ovary, × 4.

3. SYMPETALEIA Gray

Annual herbs, with both simple and barbed bristles. Leaf-blades roundish-cordate or subcordate, shallowly lobed or toothed, petioled. Flowers solitary on axillary peduncles. Peduncles short, becoming elongated and tortuous in fruit. Corolla sympetalous, tubular, its lobes rather short, a little longer than the calyx-lobes. Stamens numerous, in several series, inserted on the upper part of the corolla-tube; anthers 1-celled. Staminodia none. Style long, the stigma conspicuous. Placentae 5, alternating with the calyx-lobes. Fruit a capsule, opening at the apex inside the calyx-lobes by 5 short valves. Seeds minute, numerous, in several rows on the placentae.—Species 2, Lower California, Sonora and Southern California. (Greek sym, together or united, and petalon, leaf, that is, leaf of a corolla or petal.)

1. **S. rupestris** Gray. (Fig. 249.) Low or diffusely branching plant 3 to 6 inches high; herbage harshly pubescent; leaf-blades 1 to 4 inches wide, on petioles ¼ to 2 inches long; flowers 9 lines long; calyx-lobes elliptic; corolla-tube narrow, 6 lines long, yellowish, the lobes 1½ lines long, broadly ovate, dark green; stamens 40 to 52, inserted in several series on the upper third of the corolla-tube, the lower filaments yellow, spreading, ¼ line long, the upper green, erect, 1 line long; style slenderly obclavate; capsule oblong-obovoid and truncate, 4 lines long, on recurving or contorted peduncles 6 to 8 lines long.

Gravelly soil in the bottoms of rocky cañons, usually in shade, about 500 feet: southwest side of the Colorado Desert. South to Lower California and Sonora. Dec.-Apr.

Loc.—Only one station is known in California, namely, Painted Gorge, 7 miles north of Coyote Wells, southwest side of the Colorado Desert, *I. T. Weeks.*

Refs.—SYMPETALEIA RUPESTRIS Gray; Wats. Proc. Am. Acad. 24:50 (1889). *Loasella rupestris* Baill. Bull. Soc. Linn. Paris 1:650 (1886), type loc. Guaymas, Sonora, Mex.

4. PETALONYX Gray

Rough-pubescent perennial herbs or low shrubs, with alternate leaves and small whitish or yellowish flowers. Calyx-limb with 5 linear deciduous lobes as long as ovary. Petals 5, the long claws of the limbs connivent, thus simulating a 5-lobed sympetalous corolla. Stamens 5, free, long-exserted. Ovary linear, densely short-hairy, 5-ribbed, 1-celled with one pendulous ovule; style 1, long, exserted; stigma 1. Capsule small, oblong, dehiscing irregularly.—Species 5, southwestern United States and Mexico. (Greek, petalon, leaf, petal, and onyx, claw.)

Leaf-blades sessile, some or all entire.
    Leaf-blades dull or greenish-white, entire or usually some few-toothed; calyx-lobes woolly.... 1. *P. thurberi.*
    Leaf-blades green, all entire; calyx-lobes thinly pilose........2. *P. linearis.*
Leaf-blades shining, petioled, dentate........3. *P. nitidus.*

1. **P. thurberi** Gray. SANDPAPER PLANT. Thickly branched bush, woody at base, 1 to 3 feet high and 2 to 7 feet broad; leaf-blades sessile, narrow-ovate, lanceolate or triangular-lanceolate, mostly entire or some few-toothed toward the base, 3 to 8 lines long; flowers greenish-white, in short spikes or heads, these corymbosely disposed; calyx-lobes short, woolly, 1 line long; petals 2 lines long, the blades obovate, obtuse, the claws hairy; stamens 1½ times as long as the corolla; ovary subtended by 2 short bractlets; capsule 1 line long.

Desert plains and cañons, 1000 to 4000 feet: Inyo Co.; Mohave and Colorado deserts. East to southern Nevada and western Arizona. June-July.

Locs.—Cottonwood Creek at Owens Lake, *Jepson* 5093; Halloran Spr., e. Mohave Desert, *Jepson* 15,799; Painted Cañon, Mecca Hills, *Jepson* 11,686; Palm Cañon, Mt. San Jacinto, *Jepson* 1399a; McCain Spr., w. Colorado Desert, *Jepson* 8908. Also near Bakersfield, acc. *Ethel M. Rockwell.*

Refs.—PETALONYX THURBERI Gray, Mem. Am. Acad. ser. 2, 5:319 (1854), type loc. Gila River Valley, Ariz., *Thurber;* Torr. Bot. Mex. Bound. 67, pl. 22 (1859); Jepson, Man. 653, fig. 646 (1925).

2. **P. linearis** Greene. Branches many from a woody base, erect, ½ to 1¾ feet high; herbage rough; leaf-blades linear to linear-oblong, entire, obtuse or subobtuse, sessile, 6 to 12 lines long; flowers congested in close terminal clusters, the bracts ovate or suborbicular with cordate bases; corolla white, 1½ to 2 lines long; petals narrowly elliptic, narrowed to a claw nearly as long as the limb, the claw scantily hairy, the limb with a central densely hairy patch on back; capsule 1 line long, very densely hairy.

Cañons and sandy plains, 100 to 2500 feet: Colorado Desert. South to Lower California. Mar.

Locs.—Thousand Palms Cañon, *Jaeger;* Rockhouse Cañon and Deep Cañon (Bull. S. Cal. Acad. 22:9); Bard, acc. *C. V. Morton.*

Refs.—PETALONYX LINEARIS Greene, Bull. Cal. Acad. 1:188 (1885), type loc. Cedros Isl., *Greene;* C. V. Morton in Jepson Corr. 23:365 ms.

3. **P. nitidus** Wats. Stems many from the root-crown, erect or bush-like, 13 to 16 inches high; herbage scaberulose; leaf-blades broadly or round-ovate, coarsely few-dentate on each side, 7 to 12 lines long; inflorescence densely paniculate; bracts scaberulose, the margins very densely short-ciliate; corolla 4 lines long.

Desert cañons, 4000 to 7000 feet: Inyo Co.; Mohave Desert. East to Utah. July.

Locs.—Silver Cañon, White Mts., *Jepson* 7206; Panamint Range (Contrib. U. S. Nat. Herb. 4:106); Indian Wells, s. Inyo Co. (Contrib. U. S. Nat. Herb. 4:106); Cushenbury Sprs. (Zoe 4:163).

Refs.—PETALONYX NITIDUS Wats. Am. Nat. 7:300 (1873), type loc. s. Nev., *Wheeler;* Jepson, Man. 653 (1925).

DATISCACEAE. Datisca Family

Perennial herbs with alternate and in ours divided leaves. Flowers dioecious or in ours the pistillate commonly with a few stamens. Calyx synsepalous. Corolla none. Stamens indefinite. Ovary inferior, 1-celled, with 3 parietal placentae; styles 3, bifid. Fruit a capsule, opening at the top between the styles.—Genera 3, species 5, North America, Asia, Malay Archipelago.

1. DATISCA L.

Stout glabrous herb. Leaves divided and more or less incised and sharply serrate. Flowers in clusters in the axils of the leafy branches. Calyx of staminate flowers very short, with 4 to 9 unequal lobes; stamens in ours 8 to 12, mostly 10; filaments short. Calyx of pistillate flowers with ovoid tube, somewhat 3-angled, 3-toothed; stamens (when present) 2 to 4, alternate with the teeth. Seeds numerous, small, in 2 to several rows on the placentae.—Species 2, the following and one in Asia. (Derivation unknown.)

1. **D. glomerata** Baill. Durango Root. Stems commonly clustered, stoutish and somewhat fistulous, erect, branching above, 2½ to 5 (or 8) feet high; leaf-blades 5 to 6 inches long, petioled; staminate calyces less than 1 line long, the pistillate calyces 4 to 5 times as long.

Dry stream beds or washes in the foothills and mountains, 150 to 2000 feet, occasionally to 5000 or 6500 feet: almost throughout cismontane California; also in the western Mohave Desert. South to Mexico. May-June.

Locs.—Coast Ranges: Little Shasta, Siskiyou Co., *Butler* 1723; Dunsmuir, *Jepson;* Forks of Salmon, *Jepson;* Sommes Bar, Klamath River, *Chandler* 1518; Martins ranch, South Fork Trinity River, *Jepson;* Mad River near Ruth, *Tracy* 3548; Round Valley, ne. Mendocino Co., *Jepson;* Ukiah, *Condit;* Elk Mt., n. Lake Co., *M. S. Baker* 3077a; Putah Creek near Winters, *Jepson;* Vaca Mts., *Jepson* 556f; Los Guilicos, *Bioletti;* Mt. Tamalpais, *Jepson;* Orinda, Contra Costa Co., *Jepson* 13,951; Black Mt., Santa Clara Co., *Elmer* 4768; Santa Lucia Creek, Santa Lucia Mts., *Jepson;* San Miguelito Rancho, Jolon, *Jepson.* Sierra Nevada: New York Falls, Amador Co., *Hansen* 77; Wawona, *Jepson;* Kern Lake, Kern Cañon, *Jepson* 4926; Middle Tule River, *Purpus* 5626. S. Cal.: Antelope Valley, *Vogt;* Victorville, *Parish* 10,590; Acton, *Barber* 188; Santa Anita Cañon, San Gabriel Mts., *Peirson* 122; San Bernardino, *Parish;* San Jacinto Valley, *Reinhardt;* Ramona, *K. Brandegee;* Palomar, *Jepson;* Mesa Grande, San Diego Co., *E. Ferguson;* San Diego, *M. F. Spencer* 40.

Refs.—DATISCA GLOMERATA Baill. Hist. Pl. 3:407 (1872). *Tricerastes glomerata* Presl. Rel. Haenk. 2:88, t. 64 (1831), based on spms. from western Mexico and Monterey, Cal., *Haenke;* Jepson, Fl. W. Mid. Cal. 321 (1901), ed. 2, 269 (1911), Man. 654, fig. 647 (1925).

CACTACEAE. Cactus Family

By Samuel Bonsall Parish.[1]

Perennial succulent plants with columnar, cylindrical, globose or flattened stems, either continuous or jointed, simple or branching, smooth, ridged or tuberculate, furnished with specialized organs (areoles) from which are developed branches, spines, spicules (glochids), wool, flowers and other parts; ours leafless or, in Opuntia, bearing small subulate early-deciduous leaves. Flowers usually perfect, solitary or clustered, sessile. Sepals and petals numerous, intergrading, imbricated in several rows, their bases usually coalescent, forming a tube or cup superior to the ovary. Stamens numerous; filaments inserted on the throat of the perianth; anthers 2-celled. Style 1; stigma-lobes 1 to numerous; ovary 1-celled; ovules numerous, parietal. Fruit a berry, juicy, fleshy or dry; seeds usually numerous, smooth, granulate, punctate or tuberculate; testa coriaceous or bony; endosperm copious or scanty; radicle terete.—Genera 26, species about 1173, characteristic of the more arid regions of North and South America.

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[1] This paper was left incomplete by Mr. Parish. Since his death many minor additions and corrections have been made to the manuscript, including the addition of Opuntia fragilis Haw. to the California flora. Mr. Parish's concepts of genera and species have, however, been carefully preserved. The vernacular names are an addition.

Bibliog.—Engelmann, Geo., papers on Cactaceae in his Botanical Works, 109–236 (1887). Coulter, J. M., Preliminary revision of N. Am. species of Cactus, Anhalonium and Lophophora (Contrib. U. S. Nat. Herb. 3:91–132,—1894); Preliminary revision of N. Am. species of Echinocactus, Cereus and Opuntia (l.c. 3:357–462,—1896). Brandegee, K., Notes on Cactaceae (Erythea 5:111–123,—1897). Schumann, K., Gesamtbeschreibung der Kakteen, 1–832, figs. 1–117 (1898). Britton, N. L., & Rose, J. N., The Cactaceae, 1:i–vii, 1–236, figs. 1–302, pls. 1–36 (1919); 2:i–vii, 1–239, figs. 1–304, pls. 1–40 (1920); 3:i–vii, 1–255, figs. 1–250, pls. 1–24 (1922); 4:i–vii, 1–318, figs. 1–263, pls. 1–36 (1923). Vaupel, F., Cactaceae (Engler, Nat. Pflzfam. 21: 594–651, figs. 271–288,—1925). Parish, S. B., Notes on Cactaceae (Bull. S. Cal. Acad. 25:83–84, —1926); Cactaceae in Jepson, Man. 654–660 (1925). Berger, A., Die Entwicklungslinien der Kakteen, 1–108, figs. 1–71 (1926).

- Stems jointed, either cylindrical or flattened; areoles containing numerous minute barbed bristles (glochids); leaves small, subulate, early caducous; flowers and barbed spines produced from the same areoles.................1. OPUNTIA.
- Stems continuous, leafless; areoles destitute of glochids; spiniferous and floriferous areoles distinct; spines not barbed.
  - Stems globose, ovoid, cylindrical or columnar, ribbed; spines borne in clusters on the ribs.
    - Flowers produced above mature spine-clusters, below the summit of the ribs..2. CEREUS.
    - Flowers produced above nascent spine-clusters, at or near the summit of the ribs............ 3. ECHINOCACTUS.
  - Stems globose or cylindrical; spines borne on mammilliform tubercles, and the flowers produced between the spiniferous tubercles.
    - Flowers produced in the axils of mature spiniferous tubercles, and below the summit of the stem.................4. MAMMILLARIA.
    - Flowers produced in the axils of nascent spiniferous tubercles, at or near the summit of the stem.................5. CORYPHANTHA.

1. **OPUNTIA** Mill.

Plants shrub-like or arborescent, with jointed, cylindrical and tuberculate or flattened stems. Areoles produced at the axils of the small, early-caducous leaves, and bearing numerous glochids, and usually spines and wool. Flowers with rotate corollas; sepals thick, green or partly colored, grading into the yellow, purplish or reddish petals; stamens numerous, shorter than the petals; stigma-lobes short; ovary bearing leaves and glochids, and either spiny or spineless. Fruit succulent or dry, obovate or globose, truncate; seeds large, meniscoidal or discoidal, often margined; cotyledons foliaceous; embryo curved.—Species about 250, North and South America. (Ancient Latin name, formerly belonging to some other plant.)

The cylindrical-stemmed species are called Chollas (Choyas), and the flat-stemmed ones Tunas, a name also applied to their fruits. Species which produce palatable fruits are extensively cultivated in Mexico, and to a less extent elsewhere; they are also utilized for hedges. Some which have few or no spines are cultivated for forage; in times of scarcity the spiny wild species are gathered and fed to cattle, the spines being first singed off in the blaze of fires. Starving cattle will even eat the untreated plants, and on the deserts they are gnawed by rodents.

Bibliog.—Griffiths, D., Illustrated studies in the genus Opuntia (Rep. Mo. Bot. Gard. 19: 259–272,—1908; 20:81–95, pls. 2–13,—1909; 21:165–174, pls. 19–28,—1910; 22:25–36, pls. 1–18,—1911); New species of Opuntia (Proc. Biol. Soc. Wash. 27:23–28,—1914; l.c. 29:9–15,— 1916; Bull. Torr. Club 43:83–92,—1916). Britton, N. L., and Rose, J. N., A preliminary treatment of the Opuntioideae of N. Am. (Smithson. Misc. Coll. 50:503–539,—1908).

A. Joints cylindrical, tuberculate.—Subgenus CYLINDROPUNTIA.

- Spines polished, covered with loose hyaline sheaths.
  - Stems slender, the woody axis solid; tubercles flattened.................1. *O. ramosissima.*
  - Stems thick and fleshy, the woody axis a reticulate cylinder.

- Ultimate joints readily disarticulating; fruit proliferous, spineless or nearly so.
  - Tubercles nearly quadrangular; spines whitish, shining; deserts........2. *O. bigelovii.*
  - Tubercles longer than wide; spines dull yellow; coastal........3. *O. prolifera.*
- Joints firmly attached; tubercles prominent, elongated.
  - Tubercles 2 to 3 times as long as wide.
    - Fruit-spines stoutish, in bundles of 8 to 12; deserts........4. *O. acanthocarpa.*
    - Fruit-spines acicular, solitary or few; interior........5. *O. parryi.*
  - Tubercles less than twice as long as wide.
    - Tubercles ovate; principal spines 3 or 4; deserts........6. *O. echinocarpa.*
    - Tubercles flattish; principal spines 7 to 20; coastal........7. *O. serpentina.*

Spines roughened, gray, sheathless; woody axis wanting or rudimentary; deserts......8. *O. parishii.*

B. Joints flattened (that is, phylloclades), not tuberculate.—Subgenus Platyopuntia.

- Fruit dry.
  - Fruit spineless, or nearly so........9. *O. basilaris.*
  - Fruit spiny.
    - Joints somewhat turgid; areoles white-woolly........10. *O. fragilis.*
    - Joints flat and thin.
      - Areoles approximate; spines acicular or bristle-like........11. *O. erinacea.*
      - Areoles distant; spines subulate........12. *O. rhodantha.*
- Fruit fleshy or juicy.
  - Arboreous, with definite trunk; or large shrubs with upwardly spreading branches, and large and thick joints.
    - Spines wanting or few, if present whitish or brown; introduced species; coastal.
      - Fruit yellow or reddish, fleshy; umbilicus flat........13. *O. megacantha.*
      - Fruit purple, juicy; umbilicus depressed........14. *O. ficus-indica.*
    - Spines abundant, yellow; fruit purple; deserts........15. *O. chlorotica.*
  - Shrubby, much branched from the base; spiny.
    - Joints 6 to 12 inches long; flowers yellow.
      - Stems erect or ascending; cismontane S. Cal........16. *O. occidentalis.*
      - Stems declined or assurgent; deserts........17. *O. mohavensis.*
    - Joints 3 to 6 inches long; stems prostrate or assurgent; cismontane........18. *O. vaseyi.*

1. **O. ramosissima** Engelm. Pencil Cactus. Bush 1 to 6 feet high, the stems erect, few, rarely numerous, when mature gray and very woody, usually sparsely spiny above, rarely throughout, sometimes spineless; branches numerous, slender, cylindrical; tubercles tessellate, 4 to 6-angled; areoles grooved, bearing a single upwardly spreading stout spine 1 to 1½ inches long, its yellow sheath loose and shining, and below it a deflexed spine ⅛ inch long; flowers ½ inch long, purplish; fruit dry, densely clothed with slender tawny spines.

Dry washes or gravelly benches, 450 to 3500 feet: Colorado Desert; eastern Mohave Desert. East to Nevada and Arizona, south to Mexico. Apr.-May.

Frequent, the individuals solitary or distant, never gregarious. The areoles of the spiniferous forms contain wool and glochids, both abundant, but in the spineless forms both are sparse or even wanting.

Locs.—San Felipe Narrows, e. San Diego Co., *Jepson* 8795; Palm Sprs. of San Jacinto, *Parish;* Warrens Well, *Jepson* 5963; Quail Spr., *Munz* 5297; Cottonwood Spr., n. of Mecca, *Jepson* 12,622a; Riverside Mts., Colorado River, *Jepson* 5247; Needles, *Parish;* Leastalk, *Parish.*

Refs.—Opuntia ramosissima Engelm. Am. Jour. Sci. ser. 2, 14:339 (1852), type loc. near the lower Colorado River, *Parry;* Parish in Jepson, Man. 655 (1925). *O. tessellata* Engelm. Proc. Am. Acad. 3:309 (1856), "valley of the lower Colorado [River], from Sonora to the California mountains;" Pac. R. Rep. 4:52, pls. 21 and 24, fig. 20 (1856).

2. **O. bigelovii** Engelm. Jumping Cholla. Erect, 2 to 4 feet high, the usually single stem upwardly branched above, forming a close head; joints short, turgid, the ultimate readily detached, the primary strongly adhering, the lowest hanging dead and blackened about the stem; tubercles quadrangular, elevated, concealed by the abundant divergent spines, these 1 to 1¼ inches long, yellowish and glistening; flowers in clusters at the apex of the joints, greenish-yellow, 1 to 1½ inches long; fruit dry, spineless or nearly so, 1 inch long, few-seeded, usually infertile.

Dry hillsides or benches, –75 to 1130 feet: Colorado Desert. East to southwestern Nevada and to Arizona, south to Lower California. Apr.

The plants are usually gregarious, often extensively so (cf. fig. 250). The fallen joints readily take root, a single plant becoming the parent of a continually enlarging group, and as the joints adhere by their strongly barbed spines to passing animals, or are rolled along by the wind, they are carried to a distance, and may thus become the propagators of new colonies. Notwithstanding the formidable armament of the joints these plants are collected by pack rats, who heap them up in great piles for the protection of their nests.

Locs.—Mountain Sprs., *Mearns* 3153; betw. County Well and Indio, *Jepson* 6033; Whitewater, *Parish*.

Refs.—OPUNTIA BIGELOVII Engelm. Proc. Am. Acad. 3:307 (1856), type loc. Bill Williams River, w. Ariz., *Bigelow;* Pac. R. Rep. 4:50, pl. 19 (1856); Parish in Jepson, Man. 655 (1925).

3. **O. prolifera** Engelm. COAST CHOLLA. Stems several, stout, erect, 3 to 6 feet high, with numerous spreading branches, the tumid ultimate joints 3 to 6 inches long, readily disarticulating; tubercles short, each with 6 to 10 spines ½ to 1 inch long, their loose sheaths rusty-yellow; flowers red; fruit sub-globose, 1 inch long, spineless or nearly so, usually infertile, proliferous.

Arid hillsides near the coast, 5 to 500 feet: Los Angeles Co. to San Diego Co. South to Lower California. The species forms dense thickets and is propagated almost entirely by the deciduous joints. Apr.-May.

Locs.—San Pedro (Bull. N. Y. Bot. Gard. 6:422); Santa Catalina Isl. (Proc. S. Cal. Acad. 1:11); Newport, *L. M. Booth;* San Diego, *Abrams.*

Refs.—OPUNTIA PROLIFERA Engelm. Am. Jour. Sci. ser. 2, 14:338 (1852), type loc. San Diego, *Parry;* Parish in Jepson, Man. 655 (1925).

4. **O. acanthocarpa** Engelm. & Bigel. BUCKHORN CHOLLA. Erect, 2 to 6 feet high, the stout stems few, with numerous ascending branches; tubercles prominent, elongated and laterally flattened, each bearing 8 to 25 spines; spines unequal, yellow, 1 inch long or less, their sheaths whitish or yellow; flowers reddish; fruit dry, armed with bunches of 10 to 12 stoutish spines; seeds more or less angled, their margins channeled.

Arid hills, 200 to 5000 feet: eastern Mohave Desert. East to and more abundant in Nevada, Arizona and Sonora. Usually gregarious; infrequent. May.

Locs.—Bonanza King Mine, *Munz, Johnston & Harwood* 4299; Leastalk, *Parish;* Barnwell, *Jepson* 5621; Whipple Mts., Colorado River, *Jepson* 5230.

Refs.—OPUNTIA ACANTHOCARPA Engelm. & Bigel. Proc. Am. Acad. 3:308 (1856), type loc. Cactus Pass, 500 mi. w. of Santa Fe, *Bigelow;* Pac. R. Rep. 4:51, pl. 18, figs. 1–3 (1856); Parish in Jepson, Man. 655 (1925).

5. **O. parryi** Engelm. VALLEY CHOLLA. Stems few, erect, 2 to 4 feet high, branches upwardly-spreading; joints 6 to 12 inches long; tubercles prominent, ¾ inch long; areoles oblong, ⅛ inch long, bearing abundant white wool and 1 to 3 unequal acicular spines (these yellow, becoming brown in age, ½ to 1 inch long, deflexed or porrect) and 4 to 7 shorter ones; flowers numerous, clustered about the ends of the older stems, yellowish, tinged with red, ¾ inch long; fruit broadly obovate, ¾ to 1 inch long, with 3 to 4 rows of prominent tubercles, the upper ones each bearing a single acicular spine ½ to ¼ inch long; seeds 1 to several, their margins channeled.

Arid gravelly benches, 900 to 2400 feet: San Bernardino Valley and its borders; San Diego Co. Apr.-May.

Abundant but scattered and not forming close thickets. The fruit remains green and adherent to the joints for at least a year, at last becoming dry and falling off.

Locs.—Banning, *Toumey;* Riverside, *Reed;* San Bernardino, *Parish;* Upland, *Johnston;* Pala (Britt. & Rose, Cactaceae 1:57).

Refs.—OPUNTIA PARRYI Engelm. Am. Jour. Sci. ser. 2, 14:339 (1852), type loc. San Felipe, e. San Diego Co., *Parry;* Pac. R. Rep. 4:48, pl. 22, figs. 4–7 (1856); Britt. & Rose, Cact. 1:57 (1919); Parish in Jepson, Man. 655 (1925). *O. bernardina* Engelm.; Parish, Bull. Torr. Club 19:92 (1892), type loc. San Bernardino Valley, *Parish.*

6. **O. echinocarpa** Engelm. & Bigel. SUMMER CHOLLA. Erect, assurgent or declined, either 1 to few-stemmed and loosely few-branched, or with few ascending

stems and numerous spreading branches forming a compact bush 3 to 5 feet high (var. robustior); joints 3 to 6 inches long; tubercles short, ovate, each armed with 3 or 4 stout yellowish spines, ½ to 1 inch long, and 8 to 10 shorter ones; flowers clustered, yellowish, tinged with red; fruit dry, the upper areoles bearing bundles of 8 to 12 spines ¼ to ¾ inch long, usually unarmed below the middle; seeds numerous, their margins strongly channeled.

Desert areas, 1800 to 2800 feet: Colorado and Mohave deserts. East to Utah, south to Lower California. Apr.-June.

Common but solitary, or sometimes forming open groves, but never in close thickets. As here interpreted the species includes forms diverse in habit, but without satisfactory technical difference to permit segregation.

Locs.—Cabezon, *Parish* 648 (var. robustior); Piñon Wells, *Munz* 4487; Rock Creek, *Abrams & McGregor* 564; Ivanpah, *Parish.*

Refs.—OPUNTIA ECHINOCARPA Engelm. & Bigel. Proc. Am. Acad. 3:305 (1856), type loc. "valley of the lower Colorado River", that is, near mouth of Bill Williams River, Ariz., *Bigelow;* Pac. R. Rep. 4:49, pl. 18, figs. 5–10 (1856); Parish in Jepson, Man. 656 (1925). *O. echinocarpa* var. *robustior* Coult. Contrib. U. S. Nat. Herb. 3:446 (1896). *O. echinocarpa* var. *parkeri* Coult. l.c., type loc. San Diego Co., e. side of the mountains, facing the desert, *C. F. Parker.*

7. **O. serpentina** Engelm. SAN DIEGO CHOLLA. Stems declined or assurgent; branches divaricate, ascending, elongated-cylindrical, not tumid, 6 to 12 inches long; tubercles prominent, short and flattish, each bearing 7 to 20 acicular yellowish spines ¼ to ¾ inches long; flowers greenish-yellow, tinged with red, mostly 1 inch high; fruit broadly ovoid, deeply umbilicate, very spiny.

Dry coastal hills, 5 to 500 feet: San Diego. South to Lower California.

Refs.—OPUNTIA SERPENTINA Engelm. Am. Jour. Sci. ser. 2, 14:338 (1852), type loc. dry hillsides, San Diego, *Parry;* Parish in Jepson, Man. 656 (1925). *O. californica* Cov. Proc. Biol. Soc. Wash. 13:119 (1899). (?)*Cereus californicus* T. & G. Fl. 1:555 (1840), type loc. "arid hills and denuded tracts near St. Diego, California, common," *Nuttall.*

8. **O. parishii** Orcutt. MAT CHOLLA. Stems prostrate, rooting along the lower surface; branches approximate, simple or 1 to 2-branched, erect, 3 to 5 inches high; tubercles prominent, elongated, ¼ inch high; areoles circular, filled with white wool; glochids yellow, scanty; spines all sheathless and nearly destitute of barbs, roughened, the central 3 or 4 divergent, stout, flattened, ashy-gray, the lowest longest and broadest, 1 to 2 inches long, the secondary 6 to 12 acicular, unequal; flowers yellow; fruit dry, ovate, 2 inches long, the deep umbilicus filled with the withered floral segments, the areoles large, filled with cushions of white wool, bordered by abundant yellow glochids, these ¼ inch long, radiate and completely concealing the surface; seeds numerous, yellowish-white, about ¼ inch wide.

Loose sandy soil, 2500 to 3500 feet: eastern Mohave Desert; mountains on north side of Colorado Desert; infrequent.

This species forms mats in which the stems are often buried. The spines and glochids appear to the touch, and even under a lens, to be destitute of barbs, but with the microscope a few can be detected near the tips.

Locs.—Leastalk, *Parish;* Piñon Wells, *Munz* 4483; Iron Chief Mine, *Jaeger.*

Refs.—OPUNTIA PARISHII Orcutt, West Am. Sci. 10:1 (1896), type loc. Mohave Desert, *Parish;* Baxter, Cactus and Suc. Jour. 6:12 (1934). *O. clavata* Parish; Jepson, Man. 656 (1925).

9. **O. basilaris** Engelm. & Bigel. BEAVER-TAIL TUNA. Stems low and spreading, 4 to 12 inches long, few-jointed; joints orbicular to obovate, rarely ligulate, mostly obtuse, 3 to 8 inches long, glaucous, glabrous or sub-pubescent; areoles approximate, filled with abundant brown glochids, spineless; flowers 2 to 2½ inches high, light purple to rose-purple; fruit dry, spineless; seeds about ¼ inch broad, more or less angled, raphe prominent.

Arid slopes and valleys, usually in sandy soil, 2500 to 7000 feet: Inyo Co.; Mohave and Colorado deserts and their bordering montane slopes; occasional in cismontane valleys of Southern California. East to Utah, south to Sonora. Frequent; growing in small clumps. Apr.-June.

Locs.—Funeral Mts., *Jepson* 6894; Providence Mts., *Munz & Johnston* 4269; Barstow, *Jepson* 4842; Liebre Mts., *Dudley & Lamb* 4344; Cajon Pass, *Parish* 10,934; Stoddard Well, *Jepson* 5919; Bear Valley, San Bernardino Mts., *Parish;* Old Woman Sprs., *Jepson* 5962; Banning, *Toumey;* Whitewater, *Parish* 156; Wagon Wash, near Sentenac Cañon, e. San Diego Co., *Jepson* 12,503.

Var. **treleasii** Toumey. Areoles more or less elevated, filled with "yellow-brown" glochids, spineless, or bearing mostly solitary (1 to 3) diverging acicular spines ¼ inch or less long; flowers "red to scarlet", or "rose-color".—Sandy plains and slopes, 400 to 600 feet: upper San Joaquin Valley in Kern Co. (Bakersfield, *A. Kuester;* Bena sta., *Jepson* 15,596).

Refs.—OPUNTIA BASILARIS Engelm. & Bigel. Proc. Am. Acad. 3:298 (1856), type loc. Williams River, Ariz., *Bigelow;* Pac. R. Rep. 4:43, pl. 13, figs. 1–3, and pl. 23, fig. 14 (1856); Parish in Jepson, Man. 656 (1925). *O. basilaris* var. *ramosa* Parish, Bull. Torr. Club 19:92 (1892), type loc. Bear Valley (n. side), San Bernardino Mts. *O. brachyclada* Griff. Proc. Biol. Soc. Wash. 27:25 (1914), type loc. mountain valleys above San Bernardino, *Griffiths* 10,768. *O. intricata* Griff. l.c. 29:10 (1916), type loc. lower parts of mountain valleys and mouths of washes above San Bernardino, *Griffiths* 10,373. *O. humistrata* Griff. Bull. Torr. Club 43:83 (1916), type loc. mountain cañons above San Bernardino, *Griffiths* 10,787. Var. TRELEASII Toumey; Bailey, Stand. Cycl. Hort. 3:1147 (1901). *O. treleasii* Coult. Contrib. U. S. Nat. Herb. 3:434 (1896), type loc. Caliente, Tehachapi Mts., *Trelease;* Parish in Jepson, Man. 656 (1925).

10. **O. fragilis** Haw. PIGMY TUNA. Prostrate, matted, the obovate joints 1 to 1¾ inches long; areoles circular, woolly, 1 line wide, usually bearing (1 to) 4 or 5 spines; spines 2 to 12 lines long; flowers yellowish, 1 to 1⅞ inches wide; fruit spiny.

Dry flats, 3000 to 6000 feet: Siskiyou Co. North to British Columbia, east to Wisconsin and Texas. May.

Loc.—Shasta Valley, *Beatrice Wise.*

Refs.—OPUNTIA FRAGILIS Haw. Suppl. Pl. Suc. 82 (1819). *Cactus fragilis* Nutt. Gen. 1:296 (1818), type loc. "from the Mandans to the [Rocky] mountains", *Nuttall.*

11. **O. erinacea** Engelm. OLD MAN PRICKLY PEAR. Stems prostrate, the ascending or erect branches forming low clumps; joints ovate to oblong, 2 to 5 inches long; areoles approximate; spines white to brown, 1 to 3 inches long, acicular, or some bristle-like and longer; flowers nearly 2 inches long, "red" or yellow; fruit densely covered with short slender stiff spines.

Gravelly or stony slopes, 5800 to 6100 feet: Inyo Co.; southeastern Mohave Desert. East to Utah and Arizona. Infrequent.

Locs.—Panamint Range: Johnson Cañon, *Coville & Funston* 498; Hanaupah Cañon, *Jepson* 6994.

Var. **ursina** Parish comb. n. GRIZZLY BEAR CACTUS. Stems several, the ascending or erect branches forming small clumps 8 to 12 inches high; joints obovate to oblong; areoles approximate; spines all bristle-like and flexile, 1 to 8 inches long, whitish or ashy-gray, more or less copious, often entirely concealing the surface; flowers yellow, 1 to 1½ inches high; areoles of the ovary bearing wool and short, slender spines; fruit dry and very spiny.—Gravelly slopes, mountains of the southeastern Mohave Desert. In the species the spines are all, or mostly, acicular; in the variety they are all bristle-like, varying in different plants in length and copiousness.

Locs.—Ord Mts., *Alverson, Jepson* 5928 (bristles very abundant and long, the form known in cultivation as "Grizzly Bear Cactus"); Quail Sprs., *Munz* 5300 (bristles long and sparse); New York Mts., *Parish* (bristles abundant but short).

Refs.—OPUNTIA ERINACEA Engelm. Proc. Am. Acad. 3:301 (1856), type loc. "near the Mohave [River], between the Colorado [River] and the California mountains"; Pac. R. Rep. 4:47, pl. 13, fig. 8–11 (1856); Parish in Jepson, Man. 656 (1925). Var. URSINA Parish. *O. ursina* Weber; Bois. Dict. Hort. 2:896 (1898), type loc. Ord Mts.; Parish in Jepson, Man. 656 (1925).

12. **O. rhodantha** Schum. ROCK TUNA. Stems prostrate; branches few-jointed, forming clumps; joints obovate to oblong, 1 to 4 inches long; areoles distant; spines 3 to 4, stout, brownish, ½ to 1 inch long, and 2 to 3 shorter ones, all usually confined to the upper part of the joints, the lower part unarmed; flowers ½ inch high, yellowish-white, pink, or "red to salmon-color"; fruit dry and spiny; seeds small.

Montane rock-piles, 11,000 to 11,100 feet: White Mts. East to western Nebraska. Aug.

Loc.—County Line Hill, White Mts., *Jepson* 7363 (the only California collection).

Refs.—OPUNTIA RHODANTHA Schum. Gesamtbeschreib. Kakt. 735 (1898); type from Colorado, *Purpus;* Parish in Jepson, Man. 657 (1925).

13. **O. megacantha** Salm-Dyck. RANCHERIA PRICKLY PEAR. Arboreous, with a distinct trunk, 8 to 12 feet high, or a stout bush with ascending branches, 4 to 6 feet high; joints thick, oblong, 6 to 18 inches long; areoles 1 to 2 inches distant, the glochids soon deciduous, spineless, or with a few brown spines, mostly near the margins; flowers large, yellow; fruit ovoid, 3 to 5 inches long, with a broad flat umbilicus, the flesh crisp, palatable; seeds brownish.

Dry flats, 5 to 1500 feet: coastal Southern California. Mexico.

Field note.—Formerly, Opuntia megacantha was much cultivated for hedges and for fruit at the California missions and ranchos in the southern counties, about some of which, or about their former sites, remnants yet persist. In places it is spontaneous, and is occasionally used in ornamental cultivation. Both this species and the next were in cultivation in Mexico as fruit trees long previous to the discovery of America, and exhibit a degree of variability comparable to that of other fruits.

Locs.—Santa Barbara, *Parish;* Red Hill, near Upland, *Johnston;* Santa Catalina Isl. (Field Mus. Nat. Hist. Bot. 5:179); San Juan Capistrano, *Saunders.*

Refs.—OPUNTIA MEGACANTHA Salm-Dyck, Hort. Dyck. 363 (1834), type loc. Mexico; Parish in Jepson, Man. 657 (1925).

14. **O. ficus-indica** Mill. INDIAN FIG. Similar to O. megacantha in habit, size and articulation; spines usually more numerous, 1 to 3 in an areole, whitish, somewhat flattened, unequal, the longest 1 to 1½ inches long; flowers yellow or "red"; fruit ovoid, 2 to 3 inches long, the umbilicus deeply depressed, the flesh juicy, edible.

Dry flats, 5 to 1500 feet: long cultivated in coastal Southern California (as well as anciently in Mexico), it is occasionally spontaneous. Nativity not known.

Locs.—Mission Cañon, Santa Barbara, *Parish;* San Gabriel Mission, *Saunders.*

Refs.—OPUNTIA FICUS-INDICA Mill. Gard. Dict. ed. 8, no. 2 (1768); Parish in Jepson, Man. 657 (1925). *Cactus ficus-indica* L. Sp. Pl. 468 (1753), type loc. "in America calidiora".

15. **O. chlorotica** Engelm. & Bigel. GOLDEN PRICKLY PEAR. Arborescent in habit, 3 to 8 feet high, with a short and stout spiny trunk and ascending branches; joints 4 to 8 inches long, orbicular to ovoid or obovoid, light green; areoles approximate, prominent, each bearing 3 to 6 unequal slender yellow spines, mostly reflexed, about 1 inch long; flowers yellow; fruit 1½ to 2 inches long, "purple without, the flesh green, edible"; seeds small.

Stony slopes, 1000 to 5000 feet: ranges in or bordering the eastern Mohave Desert and the Colorado Desert. East to Nevada and Arizona, south to Mexico and northern Lower California. Not common or gregarious.

Locs.—Ivanpah Mts., *Parish;* Providence Mts., *Munz;* Quail Spr., *Munz* 5299; Kenworthy, on the coastal drainage of San Jacinto Mts., *Munz* 5571; San Felipe, *Parish* 1423.

Refs.—OPUNTIA CHLOROTICA Engelm. & Bigel. Proc. Am. Acad. 3:291 (1856), type loc. western Colorado River country, from the San Francisco Mts. to Mohave Creek [River], *Bigelow;* Pac. R. Rep. 4:38, pl. 6, figs. 1–3 (1856); Parish in Jepson, Man. 657 (1925). *O. curvospina* Griff. Bull. Torr. Club 43:88 (1916), type loc. betw. Nipton, e. Mohave Desert, Cal., and Searchlight, Nev., *Griffiths* 10,530.

16. **O. occidentalis** Engelm. & Bigel. THICKET TUNA. Stems several, erect or spreading, branched, forming clumps 3 to 5 feet high; joints elongated-obovate, 6 to 12 inches long; areoles remote, prominent, each bearing 1 to 4 stout brown spines ½ to 1 inch long; flowers lemon-yellow, 2 to 3 inches high; fruit obovoid, about 1½ inches long, green, becoming tardily reddish, at length dry; seeds orbicular, prominently margined, ½ inch broad.

Dry washes and sandy or gravelly mesas, 75 to 7000 feet: mountains of coastal Southern California and in the cismontane valleys from Los Angeles Co. to San Diego Co. South to northern Lower California. Common; often forming thickets.

The forms here regarded as a single variable species are alike in flower and fruit, but vary to a certain degree in the size, shape and thickness of the joints and in habit of growth, characters having some relation to geographic distribution, but affording no satisfactory lines of specific, and scarcely of varietal, distinction.

Locs.—San Fernando, *Johnston;* Rock Creek, San Gabriel Mts., *Abrams & McGregor* 558; Gold Hill, San Bernardino Mts., *Parish;* Mill Creek, San Bernardino Mts., *Parish;* Elsinore, *Abrams.*

Var. **littoralis** Parish. Plants larger and more bushy; joints thicker, usually oblong to orbicular; spines yellow or yellowish.—Near the coast from Santa Barbara to San Diego, frequent: Hollywood, *Davidson;* El Cajon, San Diego Co., *Parish.*

Refs.—OPUNTIA OCCIDENTALIS Engelm. & Bigel. Proc. Am. Acad. 3:291 (1856), type loc. "western slope of the Californian mountains near San Diego and Los Angeles," *Bigelow;* Pac. R. Rep. 4:38, pl. 7, figs. 1–2 (1856); Parish in Jepson, Man. 657 (1925). *O. covillei* Britt. & Rose, Smithson. Misc. Coll. 50:532 (1908), type loc. San Bernardino, *Vasey. O. occidentalis* var. *covillei* Parish; Jepson, Man. 657 (1925). *O. megacarpa* Griff. Rep. Mo. Bot. Gard. 20:91 (1909), type loc. Banning, *Griffiths* 9501. *O. rugosa* Griff. Proc. Biol. Soc. Wash. 27:27 (1914), type loc. Pomona, *Griffiths* 10,364. Var. LITTORALIS Parish; Jepson, Man. 657 (1925). *O. engelmannii* var. *littoralis* Engelm.; B. & W. Bot. Cal. 1:248 (1876), S. Cal. coast, Santa Barbara Co. to San Diego. *O. littoralis* Ckll. Bull. S. Cal. Acad. 4:15 (1905). *O. demissa* Griff. Rep. Mo. Bot. Gard. 22:29 (1911), type loc. San Diego (e. of), *Griffith* 9647. *O. semispinosa* Griff. Bull. Torr. Club 43:89 (1916), type loc. San Pedro, *Griffiths* 10,353.

17. **O. mohavensis** Engelm. LOST TUNA. Stems declined, the stout branches assurgent; joints widely obovate, 9 to 12 inches long; spines in clusters of 2 to 6, somewhat flattened, white, at base reddish-brown, unequal, the longest 2 inches long; glochids prominent, as much as ½ inch long; flowers yellow; fruit ovate, about 1 inch long, spineless.

Arid slopes, 2000 to 4000 feet: eastern Mohave Desert. Rare.

Opuntia mohavensis is an obscure and insufficiently known species. The original description and the scanty fragments of the type still remaining are inadequate for satisfactory determination, and the specimens cited are referred here by inference, since they represent the only platyopuntia known from the type region: Providence Mts., *Munz* 4305; Barnwell, New York Mts., *Parish.*

Refs.—OPUNTIA MOHAVENSIS Engelm. Proc. Am. Acad. 3:293 (1856), type loc. "on the Mohave [River], west of the Colorado" [River], *Bigelow;* Pac. R. Rep. 4:40, pl. 9, figs. 6–8 (1856); Britt. & Rose, Cact. 1:145 (1919); Parish in Jepson, Man. 657 (1925).

18. **O. vaseyi** Britt. & Rose. MESA TUNA. Stems prostrate or declined, the spreading branches 6 to 12 inches long, forming close and often large mats; joints green or glaucous, ovate, obovate or orbicular, 3 to 6 inches long; areoles large, each bearing 1 to 3 short brownish spines, rarely partly or quite spineless; flowers clear yellow to salmon-yellow, 1½ to 1¾ inches wide; fruit spineless, ovate to globose, the umbilicus flat or depressed, purple, the flesh juicy; seeds numerous, brown.

Dry washes or sandy mesas, 75 to 1000 feet: cismontane valleys in Los Angeles and San Bernardino Cos. May.

Locs.—Hollywood, *Davidson;* Upland, *Johnston;* San Bernardino, *Parish.*

Var. **magenta** Parish. Flowers magenta; otherwise as the species.—with the species throughout its range: San Bernardino, *Parish;* Redlands, *Parish;* Colton, *Parish.*

Refs.—OPUNTIA VASEYI Britt. & Rose; Smithson. Misc. Coll. 50:532 (1908); Parish in Jepson, Man. 657 (1925). *O. mesacantha* Raf. var. *vaseyi* Coult. Contrib. U. S. Nat. Herb. 3:431 (1896), type loc. "Yuma, Ariz.," *Vasey,* the locality doubtless erroneous. *O. angustata* Engelm. Proc. Am. Acad. 3:292 (1856), as to the Cajon Pass specimen only. Var. MAGENTA Parish; Jepson, Man. 657 (1925). *O. magenta* Griff. Rep. Mo. Bot. Gard. 19:268 (1908), type loc. Redlands. *O. rubiflora* Dav. Bull. S. Cal. Acad. 15:33 (1916), type loc. Hollywood, *Davidson.*

2. **CEREUS** Mill.

Plants varying greatly in form and habit, ours columnar, oblong or cylindric with spine-bearing ribs. Floriferous areoles situated above mature spiniferous ones, the flowers therefore lateral. Flowers funnelform, with short tube and spreading limb. Ovary bearing scales which are with or without spines or wool in the axils. Seeds numerous, small, black.—Species about 200, North and South America, also the West Indies. (Latin, cereus, torch.)

The genus Cereus has been divided by some authors into more than fifty genera, but those in which our species are included are here regarded as subgenera. Many species are highly esteemed in cultivation for their beautiful flowers. Hedgehog Cactus is a name applied to various species of the subgenus Echinocereus.

Bibliog.—Berger, A., Systematic revision of the genus Cereus (Rep. Mo. Bot. Gard. 16:57–86, pl. 1–12,—1905). Britton, N. L., and Rose, J. N., The genus Cereus and its allies in N. Am. (Contrib. U. S. Nat. Herb. 12:413–437,—1909).

Stem cylindrical.
  Stems low, much-branched; flowers small, yellow; tube and ovary spiny; fruit spiny.—Subgenus BERGEROCACTUS.......1. *C. emoryi.*
  Stems arboreous, solitary; flowers white; tube and ovary sparsely scaly; fruit spineless or nearly so.—Subgenus CARNEGIEA.......2. *C. giganteus.*
Stem oblong; tube, ovary and fruit spiny.—Subgenus ECHINOCEREUS.
  Stems in loose clusters, few; flowers purple.......3. *C. engelmannii.*
  Stems in compact clumps, numerous.
    Flowers scarlet.......4. *C. mohavensis.*
    Flowers cerise-pink.......5. *C. munzii.*

1. **C. emoryi** Engelm. COAST BUTTON CACTUS. Stems prostrate; branches numerous, erect or assurgent, cylindric, 5 to 9 inches long, densely spinose; ribs 20 to 25, low; areoles circular, felted; spines acicular, yellow, unequal, 20 to 30, radiate, about ¼ inch long, 1 to 2 of the uppermost 1 to 1½ inches long, porrect, or these sometimes wanting; flowers clustered at the summit of the branches, yellow, about ½ inch high, with short tube and expanded limb; fruit globose, densely covered with setae and long acicular spines; seeds large, obovate, minutely tuberculate.

Dry hills near the coast: Santa Barbara Isls.; Orange and San Diego Cos. South to adjacent Lower California. Gregarious, forming dense patches. Apr.

Locs.—Santa Catalina Isl., *Pendleton* 1424; San Clemente Isl. (Zoe 1:137); Tia Juana Hills, *Abrams* 3473.

Refs.—CEREUS EMORYI Engelm. Am. Jour. Sci. ser. 2, 14:338 (1852), type loc. "about the boundary line" (betw. Cal. and L. Cal.), near San Diego, *Parry;* Parish in Jepson, Man. 658 (1925). *Echinocereus emoryi* Rümpl.; Först. Handb. Cact. ed. 2, 804 (1885). *Bergerocactus emoryi* Britt. & Rose, Contrib. U. S. Nat. Herb. 12:435 (1909).

2. **C. giganteus** Engelm. SUWARRO. GIANT CACTUS. Stems simple, or with 1 to several ascending branches, up to 36 feet high; ribs 12 to 24, prominent; areoles densely filled with brown felted wool; spines subulate, or at the flowering apex acicular, in clusters of 10 to 20, the 1 or 2 centrals 1 to 2 inches long, exceeding the others; flowers 3½ to 4 inches high, the stout green tube 1¼ to 1½ inches long, the spreading limb white or creamy, 2 inches wide when expanded, becoming somewhat reflexed; stamens very numerous, these and the style white; ovary oblong, bearing a few scales having wool in their axils; fruit elongated-obovate, red or purple, its scales few and distant, with or without short acicular spines in their axils, when mature splitting down from the top and exposing the red pulp; seeds numerous, ovoid, black and shining.

Gravelly flats or rocky hillsides, 100 to 300 feet: west bank of the lower Colorado River in Riverside and Imperial Cos. East to Arizona, south to Mexico.

In California Cereus giganteus is known only from three small groups on the Colorado River: San Bernardino County shore opposite mouth of Bill Williams River, *Jepson;* Whipple Mts., opposite Giers basin, *Jepson* 5231; near Potholes, *J. Grinnell.* On the Arizona shore it occurs opposite and a little below Picacho, *Jepson;* and also in Purple Hills Pass, *Jepson.* In parts of Arizona it is abundant and extends into Sonora. The fruit and its seeds are important articles of food with the Arizona Indians, and the woody rods which form the supporting skeleton of the stems afford them material for building and fencing.

Refs.—Cereus giganteus Engelm.; Emory, Mil. Reconn. 159, ill. opp. p. 72 (1848), type loc. along the Gila River; Bot. Mex. Bound. frontisp. (1859); Bot. Wheeler, frontisp. (1878); Parish in Jepson, Man. 658 (1925). *Pilocereus giganteus* Rümpl.; Först. Handb. Cact. ed. 2, 662 (1885). *Carnegiea gigantea* Britt. & Rose, Jour. N. Y. Bot. Gard. 9:188 (1908).

3. **C. engelmannii** Parry. Saints Cactus. Stems few, oblong, erect, 6 to 12 inches high; ribs 11 to 13; spines in clusters of 10 to 12, straight, or somewhat decurved, white or yellow, becoming brown in age, divergent, the central 3 or 4 subulate, 1 to 1½ inches long, radials 8 to 15, unequal, short, acicular; flowers purple, 2 to 3 inches long; fruit orbicular to obovate, covered with clusters of acicular spines from felted or pubescent areoles, ½ to ¾ inch long; seeds puncticulous.

Stony or gravelly hills or dry washes, 1200 to 4000 feet: Inyo Co.; eastern Mohave Desert; Colorado Desert. East to Utah and Arizona, south to Sonora and northern Lower California. Frequent, but scattered. Individuals exhibit considerable variation in the color, length and curvature of the spines. Apr.-May.

Locs.—Hanaupah Cañon, Panamint Range, *Jepson* 7100; Ivanpah Mts., *Parish;* Providence Mts., *Munz* 4297; Ord Mt., *Jepson* 5927; Chocolate Mts., *Munz & Keck* 5013; Piñon Wells, *Munz* 4486; Whitewater, *Hall* 452; Wagon Wash, near Sentenac Cañon, e. San Diego Co., *Jepson* 12,537; Jacumba, *McGregor* 1011.

Refs.—Cereus engelmannii Parry; Engelm. Am. Jour. Sci. ser. 2, 14:338 (1852), type loc. "mountains about San Felipe, on the eastern declivities of the Cordilleras", e. San Diego Co., *Parry;* Parish in Jepson, Man. 658 (1925). *Echinocereus engelmannii* Rümpl.; Först. Handb. Cact. ed. 2, 805 (1885).

4. **C. mohavensis** Engelm. & Bigel. Cliff Cactus. Stems numerous, 4 to 8 inches long, densely compacted in rounded clumps; ribs 10 to 12, tuberculately irregular; spines 3 to 8, whitish or gray, straight or curved, the centrals 1 to 3, subulate, 1 to 1½ inches long, the others similar but shorter, radiate and interlocking; flowers scarlet, 2 to 2½ inches long; ovary and fruit covered with short slender spines.

Crevices of cliffs in desert ranges or on valley floors or mesas, 4000 to 5000 feet: mountains on north side of Colorado Desert; Mohave Desert; Inyo Co. East to adjacent Nevada and Arizona. The clumps consist of about 20 to 150 stems but as many as 600 have been counted, all from a single root. May.

Locs.—Piñon Wells, n. of Indio, *Munz* 4484; Cushenbury Cañon, *Parish* 1243; Ord Mt., *Jepson* 5873; Providence Mts., *T. Brandegee;* New York Mts., *Jepson* 5444; Ivanpah Mts., *Parish;* Hanaupah Cañon, Panamint Range, *Jepson* 7087; Silver Cañon, White Mts., *Jepson* 7413.

Refs.—Cereus mohavensis Engelm. & Bigel. Proc. Am. Acad. 3:281 (1856), type loc. on the Mohave River, *Bigelow;* Parish in Jepson, Man. 658 (1925). *Echinocereus mohavensis* Rümpl.; Först. Handb. Cact. ed. 2, 803 (1885).

5. **C. munzii** Parish. Stems oblong, stout, erect, in compact clumps of 8 to 20; ribs rather low; central spines 2 to 4, subulate, unequal, 1 to 2 inches long, stouter than the 10 to 12 inch-long radials, all ashy-gray or whitish; flowers cerise, tubular-campanulate, the spiny tube short and the spreading limb 2 to 2½ inches broad, scales of the ovary subulate, early deciduous; fruit rose-red, obovoid, 1 inch high, crowned by the withered corolla, covered with clusters of about 10 unequal acicular spines ⅛ to ½ inch long, which are readily deciduous, filled with a white pulp, edible, but insipid, in which the numerous minute black seeds are imbedded.

Dry rocky hillsides, 4500 to 7000 feet: San Bernardino and San Jacinto mountains. Apparently infrequent. Both this and the two preceding species are diurnal.

Locs.—Big Bear Valley (e. end), San Bernardino Mts., *Munz* 5759; Kenworthy, Thomas Valley, San Jacinto Mts.

Ref.—Cereus munzii Parish, Bull. S. Cal. Acad. 25:48 (1926), type loc. Kenworthy (2 miles below), Thomas Valley, San Jacinto Mts., *Munz & Johnston* 5570.

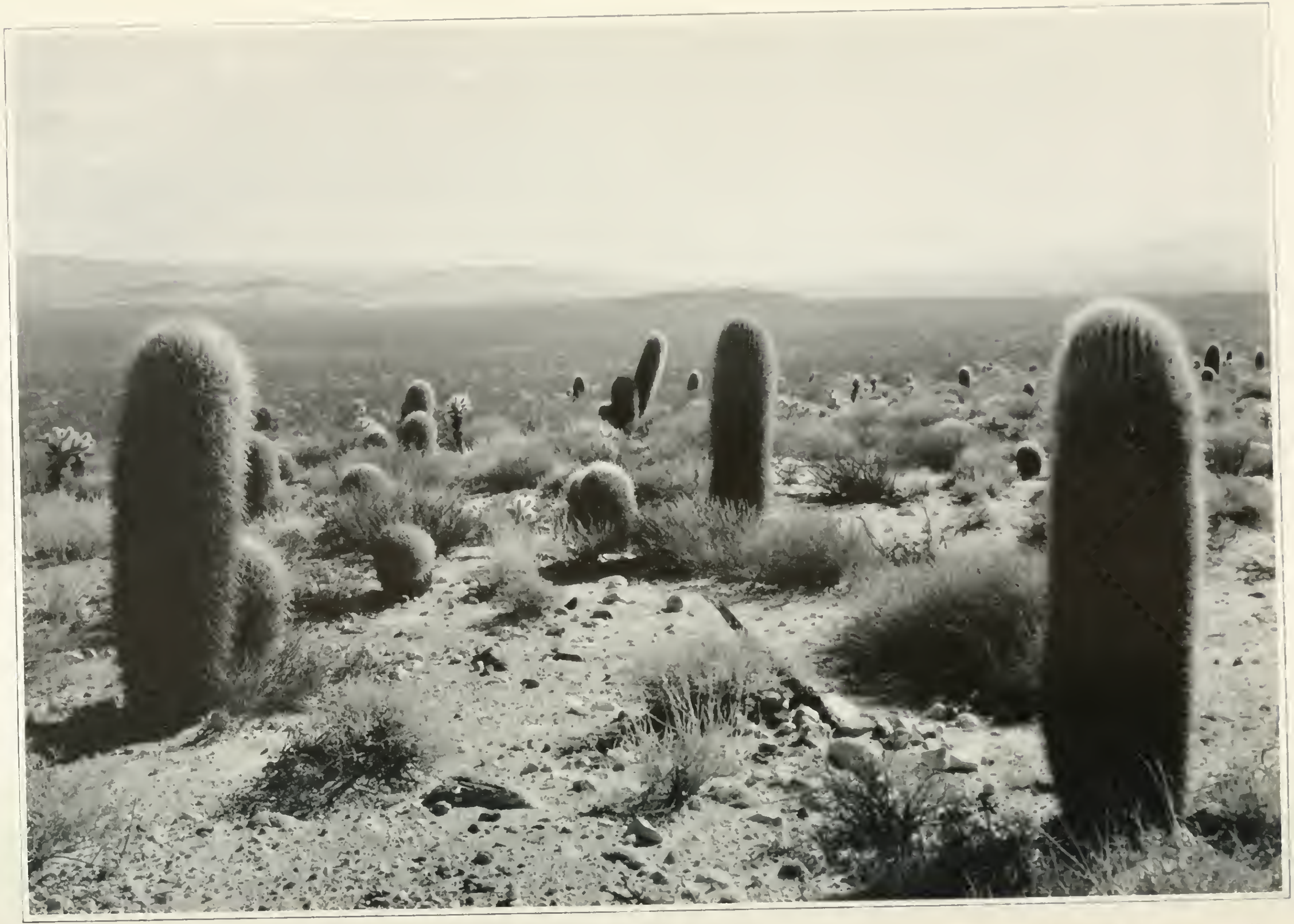

Fig. 250. ECHINOCACTUS ACANTHODES Lem. Colony of the California Barrel Cactus on the mesa in the Coachella Valley, 10 miles east of Whitewater and near the Devil's Garden, northwest arm of the Colorado Desert. Small plants of Opuntia bigelovii Engelm. in the background. (W. M. Pierce, photo., 1933.)

3. ECHINOCACTUS Link & Otto

Plants with cylindric, oblong, obovoid or globose stems and numerous ribs, in all ours spiniferous. Flowers in our species campanulate, borne on areoles among the nascent spiniferous areoles, therefore at or near the summit of the stem. Ovary scaly. Fruit globose to ovoid, in our species all dehiscing by a basal pore. Seeds black, rarely brown, smooth, pitted or tuberculate.—Species about 260, North and South America. (Greek echinos, spine, and cactus.)

The plants are mostly of large size, many of them bearing showy flowers. Some of the larger plants afford a welcome succor to thirst-famished travelers in the deserts, who by slicing off the summit of the stem and pounding up the succulent tissue form a basin in which collects a quantity of potable juice. Phonograph needles have been manufactured from the stout corneous spines of certain species; from the flesh of some a sweetmeat is made.

Spines stout, flattened.
  Scales of the ovary acicular, their axils copiously woolly; stems globose, aggregated................ 1. *E. polycephalus.*
  Scales of the ovary obtuse; stems simple, rarely few-branched.
    Scales of the ovary numerous, spirally imbricated; stems cylindrical; spines elongated.... 2. *E. acanthodes.*
    Scales of the ovary few, scattered, scarious.
      Scales of the ovary naked in the axils; stems depressed-globose; spines short............ 3. *E. viridescens.*
      Scales of the ovary tufted in the axils; stems oblong; central spines hooked............. 4. *E. polyancistrus.*
Spines subulate; scales of the ovary few, scattered...5. *E. johnsonii.*

1. **E. polycephalus** Engelm. & Bigel. NIGGER-HEAD CACTUS. Stems globose, rarely oblong or obovate, 8 to 10 inches in diameter, forming compact heaped-up clumps of 10 to 60 heads; ribs 10 to 20, tuberculately irregular; spines all stout, flattened, reddish-gray when young, becoming ashy-gray, the centrals 3 to 5, unequal, 1 to 3 inches long, curving but not hooked, radials 8 to 10, shorter and unequal; flowers yellow, 1½ to 2 inches long, little surpassing the acicular scales of the ovary and enveloped in the abundant wool of their axils; fruit dry, densely woolly; seeds angulate, minutely tuberculate.

Rocky places, 2000 to 5000 feet: Inyo Co.; eastern Mohave Desert; mountains on north side of the Colorado Desert. East to adjacent Nevada and Arizona. Reported also from Utah and Sonora. Feb.-Mar.

Locs.—Panamint Range, *Parish;* Ivanpah Mts., *Parish;* Goffs, *Parish;* Barstow, *Jepson* 4781; Cushenbury Cañon, *Parish;* Coyote Holes, Little San Bernardino Mts., *Munz* 5294.

Refs.—ECHINOCACTUS POLYCEPHALUS Engelm. & Bigel. Pac. R. Rep. 4:31, pl. 3, figs. 4–6 (1856), type loc. eastern Mohave Desert, *Bigelow;* Proc. Am. Acad. 3:276 (1856); Parish in Jepson, Man. 659 (1925).

2. **E. acanthodes** Lem. CALIFORNIA BARREL CACTUS. CALIFORNIA BISNAGA. (Fig. 250.) Stems simple, erect, stout, cylindric, 2 to 8 feet high; ribs 18 to 28, approximately tuberculate; nascent areoles abundantly woolly; central spines 1 to 4, stout, flattened or obscurely ridged, erect or decurved, 2 to 6 inches long, unequal, the longer ones curved, or even slightly hooked; radials 5 to 7, stout, and 3 to 7, slenderer; flowers yellow, 1 to 2 inches long, outer segments narrowly oblong, the inner linear; filaments yellow; style greenish, stigma-lobes about 14, yellow; scales of the ovary ovoid, more or less fimbriate, naked in the axils; fruit oblong-obovate, 1 to 1¼ inches long, greenish, thick-walled, becoming dry; seeds smooth and shining.

Rocky hills or gravelly benches, –75 to 1130 feet: Mohave and Colorado deserts. East to Nevada, south to northern Lower California. Frequent; usually solitary and few, rarely abundant and approximate. Apr.-May.

It is rarely that small globose branches are developed at the base or on the sides of the stems; younger plants, 2 to 3 feet high, are sometimes elongated-obovoid. The spines are usually more or less red, but are sometimes yellow or white; they vary greatly in length and degree of curvature, and are frequently very long, abundant and much intertangled.

Locs.—Panamint Range, *Parish;* Ivanpah Mts., *Parish;* Providence Mts., *Munz & Johnston*

4298; Cottonwood Spr., n. of Mecca, *Hall* 6013; Whitewater, *Parish* 163; Wagon Wash, near Sentenac Cañon, e. San Diego Co., *Jepson* 12,500; Mountain Sprs., e. San Diego Co., *Shreve.*

Refs.—ECHINOCACTUS ACANTHODES Lem. Cact. Gen. Nov. Sp. 106 (1839), type from Cal. *E. cylindraceus* Engelm. Proc. Am. Acad. 3:275 (1856), type loc. San Felipe, e. San Diego Co., *Parry;* Parish in Jepson, Man. 659 (1925). *Ferocactus acanthodes* Britt. & Rose, Cact. 3:129 (1922).

3. **E. viridescens** T. & G. HIDDEN BISNAGA. Stems simple, rarely 1 to few-branched from the base, 7 to 10 (or 15) inches high, and usually as broad as high; ribs 10 to 20, tuberculately irregular; central spines 4, stout, brown, compressed, cruciately divergent, 1 inch long or less, the lowest longer and broader than the others; radials 10 to 20, acicular, unequal, less than ½ inch long; flowers 1½ inches long, yellowish, each petal having a reddish central stripe; fruit ovoid to sub-globose, nearly 1 inch long, greenish, its broadly subcordate scales few and distant; seeds minutely pitted.

Dry grassy hills, 5 to 1200 feet: San Diego. Adjacent Lower California. Depressed and often hidden by the surrounding herbage.

Locs.—Old Town, *Parish* 375; Mission Hills, San Diego, *Abrams* 3395.

Refs.—ECHINOCACTUS VIRIDESCENS T. & G. Fl. 1:554 (1840), type loc. San Diego, *Nuttall;* Parish in Jepson, Man. 659 (1925). *Ferocactus viridescens* Britt. & Rose, Cact. 3:140 (1922).

4. **E. polyancistrus** Engelm. & Bigel. MOHAVE BISNAGA. Stems simple, oblong, 8 to 12 inches high; ribs 12 to 16, prominent and narrow, tuberculately irregular; central spines 5 to 10, more or less hooked, the uppermost one gray, stout, 2 to 3 inches long, flattened, 1-ridged above, porrect, the others brown or reddish, unequal, 1 or 2, divergent and interlocked; radials 15 to 20, white, acicular, straight, ¼ to ½ inch long; flowers magenta, about 2 inches long; scales of the ovary few and small, ovate, hyaline-margined; fruit pyriform, dry, nearly naked; seeds tuberculate.

Stony or gravelly mesas, 2000 to 4500 feet: eastern Mohave Desert; Inyo Co. East to adjacent Nevada. Infrequent, solitary or widely distant. Apr.-June.

Locs.—Barstow, *Parish;* Copper City, *Parish;* betw. Shoshone and Death Valley Jct., *F. Gilman.*

Refs.—ECHINOCACTUS POLYANCISTRUS Engelm. & Bigel. Proc. Am. Acad. 3:272 (1856), type loc. "eastern slope of the California mountains, at the head of the Mojave River", *Bigelow;* Pac. R. Rep. 4:29 (1856), "headwaters of the Mohave, * * * one day before reaching Cajon Pass", *Bigelow;* Parish in Jepson, Man. 659 (1925). *Sclerocactus polyancistrus* Britt. & Rose, Cact. 3:213 (1922).

5. **E. johnsonii** Parry var. **octocentrus** Coult. DWARF BISNAGA. Stem simple, oblong, up to 8 inches high; ribs 20 to 24, narrow, tuberculately irregular; spine-clusters closely set, concealing the surface; spines carmine within, with ashy-gray exterior, all subulate, straight or slightly curved, never hooked, the centrals "8", 1½ to 1¾ inches long, radials 10 to 14, slender, ½ to 1¼ inches long; flowers open-campanulate, the outer segments green, inner petals "pink"; ovary 1 inch high, bearing a few broad scarious fimbriate-margined scales; fruit 1 inch long, nearly naked; seeds numerous, black, reniform, minutely and closely pitted.

Dry mountain slopes, 3000 feet: Resting Springs Mts., Inyo Co.

Refs.—ECHINOCACTUS JOHNSONII Parry var. OCTOCENTRUS Coult. Contrib. U. S. Nat. Herb. 3:374 (1896), type loc. mts. e. of Resting Sprs., Inyo Co., *Coville & Funston* 278; Parish, Bull. S. Cal. Acad. 25:83 (1926). *E. johnsonii* Parish; Jepson, Man. 659 (1925) in part. The var. LUTESCENS Parish (Bull. S. Cal. Acad. 25:83,—1926), a form with yellow flowers, is found at Searchlight, in adjacent Nevada, and may be expected on the California side of the boundary. The species, with purple flowers, occurs in southern Utah.

ECHINOCACTUS LECONTEI Engelm. Proc. Am. Acad. 3:274 (1856), lower Gila River, Ariz., *J. L. LeConte;* Pac. R. Rep. 4:29 (1856), and E. EMORYI Engelm.; Emory, Mil. Reconn. 157 (1848), lower Colorado River, Ariz., *Emory;* Pac. R. Rep. 4:31 (1856). These two species were reported from the Mohave Desert by early explorers, but no subsequent collections have been made, although the region has been much explored in recent years, and is now much better known. The early reports were probably founded on misdeterminations of specimens of other species of the region.

4. MAMMILLARIA Haw.

Plants small, globose or short-cylindrical, simple or few-branched. Spines straight or hooked, produced from areoles at the apex of mammilliform tubercles, which are ungrooved and spirally disposed. Flowers solitary, funnelform or campanulate, red, pink, yellowish or white, borne from the axils of mature tubercles, therefore below the summit of the stem. Fruit a clavate scarlet berry, destitute of scales. Seeds black or brown, with or without an appendage.—Species about 200, North and South America and the West Indies. (Latin mammila, referring to the nipple-like tubercles.)

Most species are very local in their distribution. Many are in cultivation for their odd appearance or the beauty of their flowers. Those having hooked spines are called "Fish-hook Cactuses" and those with straight spines, "Pincushion Cactuses". The fruits are often called "Desert Strawberries", and while small they are edible and agreeably acid.

Seeds immersed in a corky appendage.—Subgenus PHELLOSPERMA........................1. *M. tetrancistra.*
Seeds destitute of an appendage.—Subgenus EUMAMMILLARIA.
  Floral segments yellowish........................2. *M. dioica.*
  Floral segments white........................3. *M. incerta.*

1. **M. tetrancistra** Engelm. YAQUI CACTUS. Stems oblong, 4 to 10 inches high, usually simple; tubercles with crisped wool in the axils when young, becoming naked; central spines 1 to 4, acicular, about 1 inch long, dark purple nearly to the white base, one or all hooked; radials numerous, straight, unequal, white, shorter and slenderer than the centrals, radiate and concealing the surface; flowers purple, 1 inch long, the outer segments ciliate; fruit clavate, bright red, ½ to 1 inch long; seeds black, minutely tuberculate, immersed at base in an ash-colored cupulate appendage.

Gravelly or stony benches or slopes, –200 to 2000 feet: Colorado and Mohave deserts; Inyo Co. East to western Nevada. Infrequent; solitary or distant. Apr.

Locs.—Yaqui Well (Ironwood Well), e. San Diego Co., *T. Brandegee;* Andreas Cañon, Palm Sprs. of San Jacinto, *Munz* 5016; Whitewater, *Parish;* Cottonwood Spr., n. of Mecca, *Evermann;* Death Valley, *Parish.*

Refs.—MAMMILLARIA TETRANCISTRA Engelm. Am. Jour. Sci. ser. 2, 14:337 (1852), type loc. "from San Diego to the junction of the Gila [River] with the Colorado," *Parry;* Parish in Jepson, Man. 659 (1925). *M. phellosperma* Engelm. Proc. Am. Acad. 3:262 (1856). *Cactus tetrancistrus* Coult. Contrib. U. S. Nat. Herb. 3:104 (1894). *Phellosperma tetrancistra* Britt. & Rose, Cact. 4:60 (1923).

2. **M. dioica** K. Bdg. WREATH CACTUS. Stems frequently branched from the base and rarely above it, globose to short-cylindrical, 2 to 10 inches high; axils of the young tubercles containing wool and 4 to 15 short bristles; central spines 1 to 4, brown, acicular, the lowest, when more than one, stouter than the others, about ¼ inch long, upwardly hooked; radials 10 to 20, white, slender, about ⅓ inch long, radiate and concealing the surface; flowers incompletely dioecious, yellowish, with purplish midrib, 1 inch high; fruit ½ to 1 inch long; seeds black, minutely pitted.

Sandy soil, 1 to 500 feet: about San Diego. Southward along the coast of Lower California. Often abundant.

Locs.—Mt. Soledad, False Bay and Paradise Valley, acc. *Ethel B. Higgins;* mouth of Sweetwater River, *Parish* 10,775.

Refs.—MAMMILLARIA DIOICA K. Bdg. Erythea 5:115 (1897), type loc. "from San Diego a short distance north, but southward to Cape St. Lucas"; Parish in Jepson, Man. 660 (1925).

3. **M. incerta** Parish sp. n. Stems short-cylindrical, simple or few-branched at the base, 3 to 4 inches high; lower central spine purple, hooked, ¾ inch long, a little exceeding the one or two straight ones; radials 12 to 15, bristle-like, nearly equal, about ½ inch long; flowers campanulate, ½ to ¾ inch long, white, each petal marked on the back by a reddish-brown medial stripe; fruit obovate to clavate, ½ to 1 inch long; seeds minutely punctate.—(Caules cylindrici, breves,

simplices vel ramis parvis ad basin, unc. 3–4 alti; flores campanulati albi unc. ½–¾ alti; fructus obovatus vel clavatus, unc. ½–1 longus.)

Cañons, 1000 to 2000 feet: western borders of the Colorado Desert. Seldom collected and little known; possibly only a form of M. dioica K. Bdg.

Locs.—Vallecito, *Parish* 450 (type); Coyote Cañon, *Hall* 2850; Dead Indian Cañon, *Jaeger;* Deep Cañon, San Jacinto Mts., *L. J. Childs;* Shavers Well (e. of), *Jones.*

Refs.—MAMMILLARIA INCERTA Parish. *M. grahamii* Parish; Jepson, Manual 660 (1925); not M. grahamii Engelm. (1856).

5. CORYPHANTHA Lem.

Plants of the same form and habit as in the preceding genus, but tubercles grooved on the upper side. Spines straight or hooked. Flowers campanulate, produced among the nascent tubercles from the base of the groove. Ovary naked, or rarely sparsely squamose. Fruit green or greenish, the withered perianth long persisting. Seeds small, brown.—Species 36, North America. The genus has generally been regarded as a section of Mammillaria, but consistency in the treatment of the family is best preserved by its recognition. (Greek koryphe, a cluster, and anthos, flower.)

Flowers straw-color or yellowish..........1. *C. chlorantha.*
Flowers purplish..........2. *C. alversonii.*

1. **C. chlorantha** Britt. & Rose. Foxtail Cactus. Stems simple, or 2 to 5-branched at base, globose or short-cylindrical, 5 to 8 inches high; tubercles approximate; central spines 4 to 8, acicular, ½ to 1 inch long, red or brown nearly to the white base, all straight; radials 20 to 25, gray, bristle-like, concealing the surface; flowers yellow or stramineous, about 1 inch high, the outer segments ciliate; fruit oblong, sparsely spinose; seeds brown, flattish, minutely pitted.

Hillsides and mesas, 150 to 5000 feet: eastern Mohave Desert; lower Colorado River. East to Utah. Infrequent and scattered.

Locs.—Ivanpah Mts., *Parish* 455; Black Pt., Riverside Mts., Colorado River, *Jepson* 5252; Bard, Imperial Co., *Schellenger.*

Refs.—CORYPHANTHA CHLORANTHA Britt. & Rose, Cact. 4:43 (1923). *Mammillaria chlorantha* Engelm.; Rothr. Bot. Wheeler 127 (1878), type loc. s. Utah, east of St. George, *Parry. Cactus radiosus chloranthus* Coult. Contrib. U. S. Nat. Herb. 3:121 (1894). *Mammillaria deserti* Engelm.; B. & W. Bot. Cal. 2:449 (1880), type loc. Ivanpah, Mohave Desert, *Parish;* Parish in Jepson, Man. 660 (1925). *Cactus radiosus deserti* Coult. l.c. 121. *Coryphantha deserti* Britt. & Rose, l.c. 46.

2. **C. alversonii** Orcutt. Stems simple, or rarely 1 to 2-branched from the base, short-cylindrical, 3 to 8 inches high; central spines 12 to 16, straight, dark purple or black above the white base, ¼ to ¾ inch long, very unequal and grading into the equally long but slenderer radials, nearly concealing the surface; flowers light purple, the outer segments strongly ciliate; fruit clavate; seeds minutely tuberculate.

Gravelly mesas, 2000 to 4000 feet: ranges between the eastern Mohave Desert and the Colorado Desert. Infrequent. It is a stouter plant than C. chlorantha, and with stouter spines, but is separated mainly on the color of the flowers. May.

Locs.—Dale, *Hall* 6036; Cottonwood Sprs., *Parish* 10,861; Chuckwalla Mts., *Munz & Keck* 5015; Anschutz Cañon, Eagle Mts., *Munz & Keck* 5013.

Refs.—CORYPHANTHA ALVERSONII Orcutt, Cactography 3 (1926). *Cactus radiosus alversonii* Coult. Contrib. U. S. Nat. Herb. 3:122 (1894), type loc. MacHaney's Mine, near Twenty-nine Palms, *Alverson. Mammillaria alversonii* Coulter; Zeissold, Monat. Kaktkunde 5:70 (1895); Parish in Jepson, Man. 660 (1925). *M. radiosa* var. *alversonii* Schum. Gesamtbeschreib. Kakt. 481 (1898).

CUCURBITACEAE. Gourd Family

Herbs, mostly tendril-bearing and succulent, with simple palmately lobed leaves. Flowers unisexual. Corolla 5 to 7-lobed, inserted on the calyx. Calyx-lobes narrow or tooth-like. Calyx-tube in the pistillate flower adherent to the 1 to 6-celled ovary; stigmas 2 or 3; placentae parietal or projecting from the axis. Staminate flower with 3 stamens, 2 of these with 2-celled anthers, the third one with a 1-celled anther. Fruit gourd-like, or dry and dehiscent. Seeds large, anatropous, without endosperm.—Genera 87, species 760, warm regions of all continents, mostly tropics.

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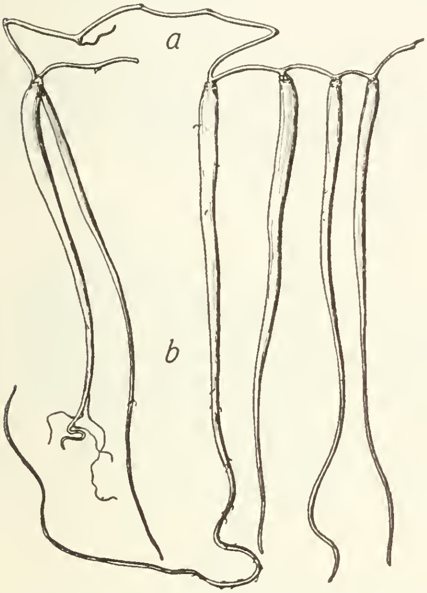


Fig. 251. Cucurbita foetidissima H.B.K. As the stems (a) trail over the ground, they sometimes develop roots (b) from the under sides of the nodes. × ¼.

Flowers large, yellow or yellowish, all solitary; fruit smooth, fleshy, 3 to 5-celled................ 1. Cucurbita.

Flowers small, white or whitish, the staminate in racemes; fruit more or less spiny or echinate, becoming dry.

  Fruit 2 or 4-celled, 2 to many-seeded; leaves scaberulous or puberulent to glabrous; mostly cismontane species...... 2. Echinocystis.

  Fruit 1-celled, 1-seeded; leaves thickly sprinkled with disk-like pustules; desert species............................3. Brandegea.

1. CUCURBITA L.

Ours perennial herbs with large roots. Stems prostrate, vine-like, scabrous. Flowers large, yellow, solitary. Filaments distinct. Fruit a smooth globose gourd, 3 to 5-celled.—Species 10, tropical America. (Ancient Latin name of the gourd.)

Leaf-blades triangular-ovate; fruit 3-celled, its pedicel without thickened ridges...................... 1. *C. foetidissima.*

Leaf-blades palmate; fruit 5-celled, its pedicel with thickened ridges at summit.........2. *C. palmata.*

1. **C. foetidissima** H.B.K. Calabazilla. Stems trailing, 5 to 15 feet long; herbage rank-smelling; leaves erect, the blades triangular-ovate, cordate or subcordate at base, 4 to 10 inches long; calyx-tube of staminate flower 6 to 8 lines long; corolla 3 to 4 inches long; gourd 3 to 4 inches in diameter.

Sandy flats or plains, 15 to 1500 feet: San Joaquin Valley to coastal Southern California; east to Nebraska and Texas; south into Mexico. June-July.

Field note.—The trailing stems sometimes develop roots at the nodes under favorable conditions of soil and moisture. Such a trailing stem with its series of fleshy cylindric roots is shown in fig. 251, the drawing of which is based on a plant grown in the Economic Garden of the University of California in 1898. The plant is also called Chili Coyote and is used by Spanish-Californians, the root as a detergent, the leaves as an internal medicine.

Locs.—San Joaquin Valley (east side): Lathrop, *H. A. Walker* 938; Merced River bridge, near jct. San Joaquin River, Stanislaus Co., *Jepson* 15,959; Knights Ferry, *Sanford* 186; Oakdale, *Jepson* 14,122; Friant, *Jepson* 12,900; Bakersfield, *Davy* 1826. Coastal S. Cal.: Mentone, *R. J.*

Smith: San Bernardino, *Jepson* 6087; Playa del Rey, Los Angeles coast, *Abrams* 2508; Chino, *Condit;* Temescal Wash, *Jepson* 1569; San Diego, *M. F. Spencer* 39.

Refs.—CUCURBITA FOETIDISSIMA H.B.K. Nov. Gen. et Sp. 2:123 (1817), type loc. Guanaxuato ("Guanajuato"), Mex., *Humboldt & Bonpland* (cf. Kew Bull. Misc. Inform. 1924:24); Blochman, Erythea 1:9 (1894); Jepson, Man. 660 (1925). *C. perennis* Gray, Jour. Bost. Soc. Nat. Hist. 6:193 (1850), "near San Antonio and New Braunfels," Tex., *Fendler.*

2. **C. palmata** Wats. COYOTE MELON. Stems trailing, several feet long; leaf-blades palmately 5-cleft, 3 to 4½ inches wide; calyx-tube of staminate flower 10 to 12 lines long; corolla 1¾ to 2¾ inches long; gourd 3 inches in diameter; seeds thicker than in C. foetidissima.

Dry plains and rocky mesas, 100 to 2400 feet: San Joaquin Valley; Death Valley; south to the Colorado Desert and coastal Southern California. East to Nevada, south to Mexico. Apr.-July.

Locs.—Oakdale, *Jepson* 14,123; Friant (across San Joaquin River, in Madera Co.), *Jepson* 12,952; Greenfield near Bakersfield, *Davy* 1861; Pleasant Cañon, Panamint Range, *Hall & Chandler* 6920; Funeral Mts., *Jepson* 6910; Lavic, e. Mohave Desert, *Jepson* 15,462; Piute Creek, e. Mohave Desert, *N. C. Wilson;* Riverside Mts., Colorado River, *Jepson* 5234; Indio Mt., *Hall* 5820; Borrego Spr., w. Colorado Desert, *T. Brandegee;* San Felipe Wash, e. San Diego Co., *Jepson* 8904; Canebrake Cañon, e. San Diego Co., *Fosberg* 8427; Riverside, *Hall* 2654; Menifee, *Alice King;* Ramona, *T. Brandegee;* Potrero, w. San Diego Co., *Cleveland.*

Refs.—CUCURBITA PALMATA Wats. Proc. Am. Acad. 11:137 (1876), type loc. Cajon Valley, San Diego Co., *Cleveland;* Jepson, Man. 660 (1925).

CUCURBITA CALIFORNICA Torr.; Wats. Proc. Am. Acad. 11:138 (1876), type loc. "Sacramento Valley", *Pickering.* On account of the locality, this is most likely to be regarded as C. palmata. It is, however, accepted as a species by Parry (Bull. Torr. Club 10:50) who emphasizes the "lobulated" or "rugose-wrinkled" fruit (which condition might, perhaps, have been caused by drying) and by Parish (Bot. Gaz. 65:342) who stresses the "harshly" pubescent herbage and "hispid" ovary. The Searchlight, Nev., spm. (no. 10,413) of Parish, determined by him as C. californica, is, however, no more harshly pubescent and its ovary no more hispid than some other desert specimens definitely belonging to C. palmata. The ovary in C. palmata appears to be always densely rough-hirsutulose when young, but rapidly becomes glabrous or nearly so.

CUCURBITA DIGITATA Gray, Pl. Wright. 2:60 (1853), type loc. betw. the copper mines and Crude's camp, N. Mex., *Wright* 1088. Leaf-blades palmately divided into linear-lanceolate lobes. —New Mexico to Arizona (Cibola Valley, lower Colorado River, on the Arizona shore, *Jepson* 5281, therefore likely to be found in California).

2. **ECHINOCYSTIS** T. & G. BIG ROOT

Trailing or climbing herbs (ours perennial) with branched tendrils and ivy-like but thin leaves. Flowers small, greenish or white, monoecious, the staminate in axillary racemes or panicles, the pistillate pediceled and solitary in the same axils. Calyx-teeth very small or obsolete. Corolla rotate or campanulate with 5 to 7 lobes or lanceolate segments. Staminate flowers with the short filaments united and the anthers distinct or coherent. Pistillate flowers with staminodia or none; ovary globose or oblong, 2 to 4-celled, with 1 to 4 ovules in each cell; style very short; stigma 2 or 3-parted or -lobed. Fruit spiny, somewhat fleshy or pulpy, at length dry and bursting irregularly on the sides or near the apex. Seeds ovoid or broadly oblong, more or less compressed, surrounded by a marginal line.—Species 25, North and South America. (Greek echinos, a hedge-hog, and kustis, a bladder, in reference to the spiny fruit.)

Biol. and geog. note.—The germination of the seed is hypogeous (cf. Gray, Structural Bot. 21). The root in Echinocystis fabacea develops into a globose or fusiform structure 6 to 9 inches in diameter, or it may become elongated, 1 to 1½ feet long, irregular in shape and sometimes resembling a man's body, whence the folk name Man-root or Old-man-in-the-ground. The roots in the other species develop likewise into large fleshy structures. The five species in California have, on the whole, nearly distinct areas: Echinocystis macrocarpa belongs to the south coast, E. oregana to the north coast, E. horrida to the southern Sierra Nevada and E. muricatus to the northern Sierra Nevada. The only species found on the floor of the Great Valley is E. fabacea; it extends west into the Coast Ranges and overlaps somewhat the range of E. oregana but always at lower altitudes, just as it extends east into the Sierra Nevada foothills at low altitudes. In addition, the species are fairly well differentiated by their fruits and seeds. The presence of abortive anthers in the pistillate flower may have some value as a differentia. The pistillate flowers in E. muricatus have none of these vestiges, but they do occur in E. macrocarpa, E. horrida and E. oregana. It appears that in the case of E. fabacea they may be absent, or again, in Berkeley plants, they may be present (*Jepson* 9632).

Corolla rotate or somewhat saucer-shaped; staminate racemes mostly with many to numerous flowers; spines more or less puberulent.
  Corolla dull or greenish white; fruit globose; central Cal........1. *E. fabacea.*
  Corolla clear white; fruit oblong; S. Cal. to Monterey Co........2. *E. macrocarpa.*
Corolla campanulate; staminate racemes relatively few-flowered.
  Herbage green; pistillate flowers with abortive anthers; spines puberulent or sometimes glabrous.
    Fruit cylindric; s. Sierra Nevada foothills........3. *E. horrida.*
    Fruit ovate or globose-ovate, commonly long-beaked; Coast Ranges........4. *E. oregana.*
  Herbage glaucous; pistillate flowers without abortive anthers; spines glabrous; n. Sierra Nevada foothills and Vaca Mts........5. *E. muricatus.*

1. **E. fabacea** Naud. Valley Man-root. (Fig. 252.) Stems 12 to 30 feet long; herbage nearly glabrous or rough-scabrous; leaf-blades more or less round-cordate in outline, 2 to 4 inches wide, shallowly or often rather deeply 5 to 7-lobed; staminate flowers many in slender simple or compound racemes 3½ to 5 inches long, the pedicels 1 to 3 lines long; corolla 3 to 4 lines wide, dull or greenish white; pistillate flowers 5 to 6 lines wide, destitute of abortive anthers or sometimes with vestiges, the pedicels 5 to 9 lines long; ovary globose, 2-celled, ovules 1 or 2 in each cell; stigma depressed, circular, almost sessile; fruit globose, 2 inches in diameter, very densely spinose; spines stout or more commonly slender, 3 to 4 (or 5) lines long, sparingly and mostly obscurely puberulent; seeds commonly 4, sometimes less, oblong-ovoid, a little flattened, more strongly so at the micropylar end, 9 to 13 lines long, 6 lines wide, surrounded by a shallow groove or darker line.

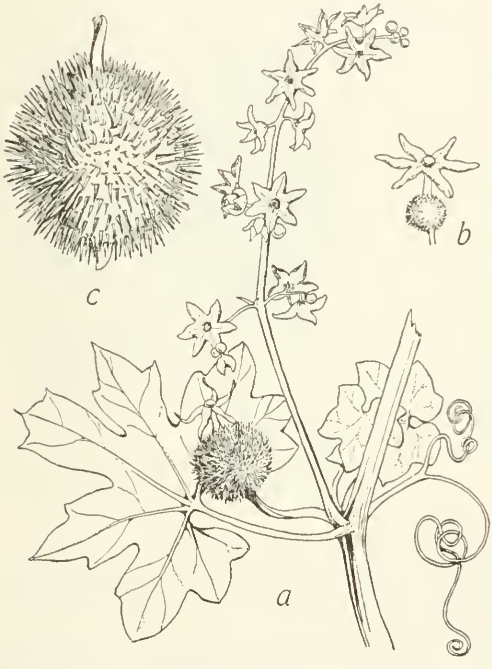


Fig. 252. Echinocystis fabacea Naud. *a*, sect. of stem with staminate and pistillate fls., × 1; *b*, pistillate fl., × 1; *c*, fr., × ½.

Sandy lunaras or high rich places of the plains and valley floors or slopes of the low hills, 50 to 2500 feet: Coast Ranges from Napa Co. to Santa Barbara Co.; Sacramento Valley floor; lower San Joaquin Valley; Sierra Nevada foothills from Butte Co. to Stanislaus Co. Jan.-Apr.

Biol. note.—The massive root begins to develop a shoot in October. This reaches the surface of the ground in December or January usually. After fruiting is completed in June or July, the stems die back completely, not to the surface of the ground, but down to the deeply seated tuber.

Locs.—Coast Ranges: Howell Mt., Napa Co., *Jepson* 14,125; Napa, *Jepson* 14,127; Berkeley Hills, *Jepson* 14,386; Mt. Davidson, San Francisco, *Jepson* 10,350; Stanford, *C. F. Baker* 512; Arroyo Mocho, Mt. Hamilton Range, *Jepson* 10,676; Sans Mill, s. Santa Lucia Mts., *Jepson* 1687; San Miguelito Creek, Lompoc, *Ewan* 7898. Sacramento Valley: College City, *Alice King;* Sutter plains near Marysville Buttes, *Jepson* 14,124; Vacaville, *Jepson* 1203. Sierra Nevada foothills: Big Chico Creek, Butte Co., *Heller* 11,193; White Bar, Mokelumne River, *Hansen* 1061; Knights Ferry, Stanislaus Co., *F. W. Bancroft.*

Var. **agrestis** Jepson. Fruits smaller with few short spines; seeds 1 to 4.—Inner South Coast Range and bordering San Joaquin plain from Contra Costa Co. to western Fresno Co.

Var. **inermis** Jepson comb. n. Corolla of staminate flowers "bright white"; stigma depressed, nearly sessile; fruit sparsely short-spiny.—Mariposa Co. foothills.

Refs.—ECHINOCYSTIS FABACEA Naud. Ann. Sci. Nat. Bot. ser. 4, 12:154, pl. 9 (1859), type from Cal.; Jepson, Fl. W. Mid. Cal. 320 (1901), ed. 2, 270 (1911), Man. 661, fig. 648 (1925). *Micrampelis fabacea* Greene, Pitt. 2:129 (1890). *Megarrhiza californica* Torr.; Wats. Proc. Am. Acad. 11:138 (1876), "Petaluma and Sonoma". Var. AGRESTIS Jepson (by error "Greene"), Man. 661 (1925). *Micrampelis fabacea* var. *agrestis* Greene, Fl. Fr. 236 (1891), type loc. "San Joaquin Valley", that is, more specifically eastern Contra Costa Co. (Man. Reg. S. F. Bay 143). *E. scabriella* Eastw. Bull. Torr. Club 30:500 (1903), type loc. Zapato Chino Creek, sw. Fresno Co., *T. Brandegee.* Var. INERMIS Jepson. *E. inermis* Congd. Zoe 5:134 (1901), type loc. Sherlock, Mariposa Co., *Congdon.*

2. **E. macrocarpa** Greene. CHILICOTHE. Stems 10 to 20 feet long; leaf-blades usually deeply lobed, 3 to 8 inches wide; corolla saucer-shaped; fruit broadly oblong, densely spiny, 3 to 4 inches long, 2 to 3 inches in diameter; spines stout, very unequal, not very rigid, ½ to 1 (or 1½) inches long; ovary 2 to 4-celled; style obvious (½ line long), bearing 3 staminodial scales; seeds 12 to 14, oblong-cylindric, nearly terete at one end, flattened at the other, 6 to 13 lines long, 5 to 6 lines wide.

Hill slopes and valley flats, 100 to 1500 feet: along the south coast from Monterey Co. to San Diego Co.; mountains on the west side of the Colorado Desert. South to Lower California. Jan.-Apr.

Locs.—Pt. Sur, *T. Brandegee;* Sycamore Cañon, Santa Inez Mts., *Jepson* 9134; Santa Rosa Isl., *T. Brandegee;* Santa Catalina Isl., *Condit;* Santa Monica, *Barber* 52; Arroyo Seco, Los Angeles, *Braunton* 797; Claremont, *C. F. Baker* 3054; Cajon Pass, *Jepson* 6122; San Bernardino, *Parish* 3633; Mission Creek, ne. of Garnet, w. end Conchilla Range, *Clary* 1476; San Diego, *Dunn.*

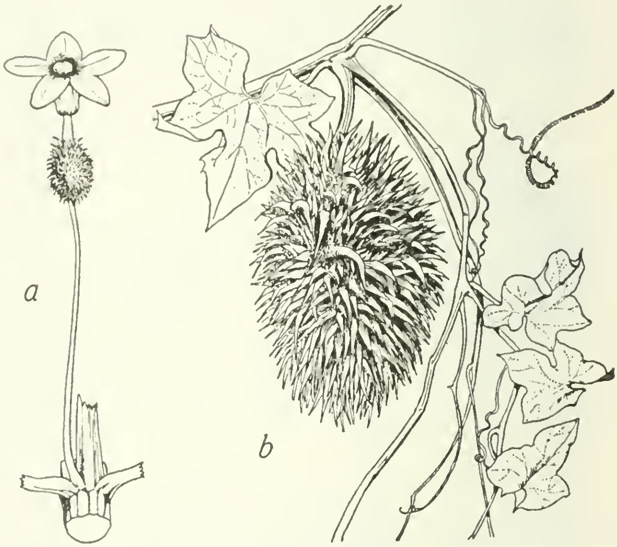


Fig. 253. ECHINOCYSTIS HORRIDA Congd. *a*, pistillate fl., × 1; *b*, sect. of fr. stem, × ¼.

Refs.—ECHINOCYSTIS MACROCARPA Greene, Bull. Cal. Acad. 1:188 (1885), type loc. Cucamonga, sw. San Bernardino Co., *Bigelow;* Jepson, Man. 662 (1925). *Megarrhiza macrocarpa* Rattan; Wats. Bull. Torr. Club 14:158 (1887). *Micrampelis macrocarpa* Greene, Pitt. 2:129 (1890). *Micrampelis leptocarpa* Greene, Pitt. 2:282 (1892), type loc. West Cañon (Tahquitz Cañon), near Palm Sprs., Mt. San Jacinto, *W. G. Wright.* *E. macrocarpa* f. *leptocarpa* Parish, Muhl. 3:125 (1907).

3. **E. horrida** Congd. SIERRA MAN-ROOT. (Fig. 253.) Stems 6 to 10 feet long; leaf-blades deeply lobed, 4 to 8 inches wide, the upper surface pustulate-scaberulous; corolla bright white, campanulate; pistillate flowers with abortive stamens; fruits 4 to 6 inches long, 2 to 3 inches in diameter, strongly spinose; spines ½ to 1¼ inches long; seeds 8 to 10, oblong, one end terete, the other flattened, 1 to 1⅛ inches long, 7 to 8 lines wide.

Hill slopes, 1000 to 3000 feet: Sierra Nevada foothills from Tuolumne Co. to Tulare Co. Feb.-Apr.

Tax. note.—Echinocystis horrida is nearly related to E. macrocarpa but the fruits differ in size and shape. The seeds also seem to differ: in E. horrida they are less cylindric or more slender, and surrounded by a slight raised margin or ridge of the same color as the body of the seed; in E. macrocarpa the seed is surrounded by a very shallow groove which is darker in color than the body of the seed. The flowers differ from those of E. fabacea: the corolla-lobes are plane in E. horrida, their margins are revolute in E. fabacea.

Locs.—Columbia, *A. L. Grant* 628; Table Mt., Jamestown, *Tracy* 5699; Mariposa Co. foothills; Watson Spr., North Fork Kaweah River, *Jepson* 587.

Refs.—ECHINOCYSTIS HORRIDA Congd. Erythea 7:184 (1900), based on spms. from Whitlock's and Patterson's, Sierra Nevada foothills in Mariposa Co., *Congdon;* Jepson, Man. 662, fig. 649 (1925).

4. **E. oregana** Cogn. HILL MAN-ROOT. Stems 4 to 25 feet long, often climbing over trees and shrubs, mostly smooth; leaf-blades muriculate-scabrous, especially on the upper surface, or almost smooth, reniform or round-cordate, 3 to 10 inches wide, shallowly or deeply 5 to 7-lobed; staminate racemes 6 to 10 inches long, the pedicels (3 or) 6 to 11 lines long; corolla 6 to 7 lines broad, clear white; pistillate flowers with abortive stamens (staminodia), the pedicels 3 to 6 lines long, or in fruit to 1¾ inches long; ovary ovate, 2 or 3-celled; ovules 1 to 4 in each cell, attached to the outer side; fruit ovate, 2 to 3½ inches long, somewhat attenuate at each end, often markedly beaked at apex, nearly smooth or sparsely covered with short weak spines; spines 2 to 3 lines long, glabrous or puberulent; seeds 6, horizontally placed, nearly circular, markedly flattened, 10 to 11 lines long, 3 to 4 lines thick.

Wooded cañon sides, 10 to 800 feet: Santa Clara Co. to Humboldt Co. North to Oregon. Often climbing over trees and shrubs. Apr.

Locs.—Los Gatos foothills, *Heller* 7262; Black Mt., Santa Clara Co., *Elmer* 4733; Millbrae, San Mateo Co., *H. A. Walker* 1681; Crystal Springs Lake, San Mateo Co., *C. F. Baker* 450; Bald Peak, Berkeley Hills, *Tracy* 669; Mt. Tamalpais, *Jepson* 14,132; Caux's Cabin, w. of St. Helena, *Jepson* 14,134; Franz Valley, e. Sonoma Co., *Jepson* 14,130; Ukiah, *Jepson* 14,128; betw. DeHaven and Ft. Bragg, *Jepson* 14,136; Rockport, Mendocino Co., *Jepson* 2220; Cotoneva Creek, Mendocino Co., *Jepson* 2219; White Thorn, s. Humboldt Co., *Jepson* 2207; Dyerville, Humboldt Co., *Jepson* 16,478; Eureka, *Tracy* 5077; Blue Lake, n. Humboldt Co., *Jepson* 1931; Gilbert Creek, Del Norte Co., *Jepson* 9359. A plant from the Santa Inez Mts. (*T. Brandegee*) seems to belong here, save that the seeds are 5 to 6 lines thick.

Refs.—ECHINOCYSTIS OREGANA Cogn. Mem. Cour. Acad. Belg. 28:87 (1878); Jepson, Man. 662 (1925). *Sicyos oreganus* T. & G. Fl. 1:542 (1840), type loc. Columbia River, *Scouler, Douglas, Tolmie. Micrampelis oregana* Greene, Pitt. 2:129 (1890). *Marah muricatus* Kell. Proc. Cal. Acad. 1:38 (1854), type loc. Mission Dolores hills, San Francisco, *Kellogg. Megarrhiza marah* Wats. Proc. Am. Acad. 11:138 (1876), a renaming of Marah muricatus Kell. *E. marah* Cogn.; DC. Monog. Phan. 3:817 (1881); Jepson, Fl. W. Mid. Cal. 320 (1901), ed. 2, 270 (1911). *Micrampelis marah* Greene, Pitt. 2:129 (1890).

5. **E. muricatus** Kell. TAW MAN-ROOT. Stems slender, not succulent, 4 to 8 feet long; herbage glaucous, especially on the under side of the leaves, smooth or only slightly scabrous, glabrous or nearly so; leaf-blades orbicular-cordate or broadly reniform, 2 to 4½ inches broad, rather broader than long, deeply 5-parted, the lobes broader above and sinuately 3-lobed; staminate racemes slender, often few-flowered, the flowers small (1½ to 2½ lines in diameter), white; pistillate flowers 3 to 5 lines broad, without abortive stamens, on slender pedicels 1 to 2 inches long; ovary smooth or somewhat spiny, the spines much dilated below the middle; fruit nearly globose, 1 to 1¼ inches in diameter, sparsely covered with weak glabrous prickles 1½ to 2½ lines long or somewhat naked toward the summit, 2 to 4-celled, 2 to 6-seeded; seeds subglobose, 7 to 9 lines long, 6 to 7 lines broad.

Cañon bottoms and hilltops, 900 to 2500 feet: Sierra Nevada foothills from Butte Co. to Calaveras Co.; Vaca Mts. Mar.

Locs.—Sierra Nevada foothills: Oroville (8 mi. n.), *Heller* 11,328; Auburn, *Bolander* 4533; Jackson, *Hansen* 97; Angels Camp (Bot. Cal. 1:242). Vaca Mts.: Weldon Cañon, *Jepson* 2188; Collins Camp, *Jepson* 14,135. While these latter are the only known Coast Range stations, the species will almost inevitably be found in the northward continuation of the inner Coast Range.

Refs.—ECHINOCYSTIS MURICATUS Kell. Proc. Cal. Acad. 1:57 (1855), type loc. Placerville;

not *Marah muricatus* Kell. (1855). *E. watsonii* Cogn.; DC. Monog. Phan. 3:819 (1881); Jepson, Fl. W. Mid. Cal. 321 (1901), ed. 2, 271 (1911), Man. 662 (1925). *Megarrhiza muricata* Wats. Proc. Am. Acad. 11:139 (1876). *Micrampelis watsonii* Greene, Pitt. 2:129 (1890).

3. BRANDEGEA Cogn.

Perennial herbs with large thick roots. Leaves with 3 to 5-parted blades. Flowers small or minute. Corolla rotate, 5-parted almost to the base. Staminodia in the pistillate flower none. Ovary 1-celled, the filiform beak very oblique; ovule 1. Fruit narrowly obovoid, indehiscent, smooth or sparsely echinate, thin-walled. —Species 4, California and Mexico. (T. S. Brandegee, 1843–1925, student of the Mexican flora.)

1. **B. bigelovii** Cogn. Stems slender, trailing; leaf-blades sub-orbicular in outline, 1 to 2¼ inches long, deeply 5-parted into narrow (1 to 5 lines wide) spreading lobes, the basal lobes mostly very small, or sometimes obsolete (the blade then 4 or 3-parted), the upper surface densely sprinkled with disk-like pustules; corolla 1 line long; body of fruit 2 to 2½ lines long, either smooth or with a few prickles above the middle or on the beak.

Sandy washes, 200 to 2500 feet: mountains between the southeastern Mohave Desert and the Colorado Desert. South into Lower California; east to Arizona. Apr.

Locs.—Hanks Well, se. San Bernardino Co., *Newlon* 551; betw. Rice and Blythe, *Munz & Harwood* 3564 (with both echinate and smooth fruits); McCoy Wash, *Hall* 5948; Red Cañon, Chuckwalla Mts., *Parish* 8291, 8292; Cottonwood Spr., Cottonwood Mts., *Jepson* 12,593; Shavers Well near Mecca, *Munz & Keck* 4760; Painted Cañon, Mecca Hills, *Jepson* 11,671. W. Ariz.: Cibola Valley, Colorado River, *Jepson* 5274.

Refs.—BRANDEGEA BIGELOVII Cogn. Proc. Cal. Acad. ser. 2, 3:58 (1890); Jepson, Man. 663 (1925). *Elaterium bigelovii* Wats. Proc. Am. Acad. 12:252 (1877), type loc. lower Colorado Valley, *Palmer, Bigelow*. *Echinocystis bigelovii* Cogn.; DC. Monog. Phan. 3:804 (1881). *Echinopepon bigelovii* Wats. l.c. 24:52 (1889). We find that in the same collection from the same locality the fruit may be smooth or with a few prickles above the middle or on the beak, wherefore we include here *B. parviflora* Wats.; Rose, Contrib. U. S. Nat. Herb. 5:120 (1897). *Echinocystis parviflora* Wats. Proc. Am. Acad. 17:373 (1882), type loc. West Cañon (Tahquitz Cañon) near Palm Sprs., e. base Mt. San Jacinto, *Wright*, acc. Parish in Rose l.c.; Parish, Bull. S. Cal. Acad. 2:81 (1903). *Echinopepon parviflora* Wats. l.c. 24:52 (1889).

THYMELAEACEAE. MEZEREUM FAMILY

Ours deciduous shrubs with simple entire alternate leaves. Flowers perfect, with corolla-like shallowly 4-cleft calyx. Stamens inserted upon the calyx, twice as many as its lobes. Corolla none. Ovary superior, 1-celled; ovule 1, pendulous.—Genera 40, species 400, all lands except those of arctic zones.

Bibliog.—Baillon, H., Thymelaeaceae in Nat. Hist. Plants 6:102–139, figs. 67–87 (1880). Gilg., E., Thymelaeaceae (Engler & Prantl, Nat. Pflzfam. 3^{6a}:216–245, figs. 75–85,—1894).

1. DIRCA L. LEATHERWOOD

Flowers in fascicles from buds containing flowers and leaves. Scales of the bud yellowish or whitish, silky, forming an involucre to the flowers, soon falling. Calyx slightly oblique, tubular below, expanded into a short throat above. Stamens 8, exserted, inserted at the base of the throat. Style slender, exceeding the stamens. Fruit drupe-like, reddish.—Species 2, North America. (Greek name of a celebrated fountain in Boeotia, the plants growing in moist places.)

1. **D. occidentalis** Gray. WESTERN LEATHERWOOD. Erect shrub 2 to 5 (or 11) feet high, with soft pliable wood and leathery bark; leaf-blades oval or obovatish, 1½ to 2¼ inches long; flowers yellow, sessile, in clusters of 2 or 3 from lateral and terminal buds, turned downward at an angle; calyx 4 lines long, its lobes a little erosulate; stamens commonly 8, sometimes 9, rarely 10.

North and east hill or cañon slopes, 400 to 1400 feet: Santa Cruz Mts.; Oakland and Berkeley hills; Marin Co. Feb.-Mar.

Field note.—In the Oakland Hills considerable colonies of Dirca occidentalis occur on the high east slope of the main ridge between Thorn Notch and Redwood Peak. Near Thorn Notch two large individuals were measured in 1914, one 8 feet 2 inches high with a trunk diameter of 4 inches at 6 inches above the ground, the other 7 feet 7 inches high with a trunk diameter of 4¼ inches at 3 inches above the ground. It also grows on cañon sides on the west slope of the Berkeley Hills, where there is sufficient moisture.

Locs.—Santa Cruz Co. (Anderson, Nat. Hist. Santa Cruz Co. 42); Stanford foothills, *C. F. Baker* 309; Lake San Andreas, *Jepson* 9536; Strawberry Cañon, Berkeley, *Jepson* 9819a; Oakland Hills, *Jepson* 5714; Tocaloma, Marin Co., acc. *Mason.*

Refs.—DIRCA OCCIDENTALIS Gray, Proc. Am. Acad. 8:631 (1873), type loc. Oakland Hills, *Bigelow;* Jepson, Fl. W. Mid. Cal. 260 (1901), ed. 2, 256 (1911); Man. 663, fig. 650 (1925).

ELAEAGNACEAE. Oleaster Family

Shrubs or small trees, the foliage scurfy with scarious scales. Flowers regular. Calyx herbaceous. Corolla none. Ovary inferior, 1-celled; ovule 1; style 1, stigma 1.—Genera 3, species about 20, northern hemisphere.

1. SHEPHERDIA Nutt.

Shrub with silvery foliage. Leaves opposite, entire, deciduous. Flowers dioecious, nearly sessile in axillary clusters or the pistillate solitary. Staminate flower: calyx 4-parted, rotate; stamens 8, alternating with the processes of the thick disk. Pistillate flower: calyx urn-shaped, 4-cleft, the orifice closed by the teeth of the 8-lobed disk. Fruit berry-like, the membranous achene closely covered by the fleshy calyx-tube.—Species 3, North America. (John Shepherd, one-time curator of the Liverpool Botanic Garden.)

1. **S. argentea** Nutt. Buffalo Berry. Stout spiny shrub or small tree 6 to 15 feet high; thorns rigid, leafy at base; leaf-blades silvery-scurfy below, greener above, mostly oblong, 1 to 1½ inches long, on petioles 2 to 4 lines long; berries red, oblong, 2½ to 3⅓ lines long, on pedicels ½ to 1 line long.

River bottoms, flats and cañons, 3500 to 6500 feet: Mt. Pinos region; Mohave Desert (rare); Mono and Alpine Cos. North to British Columbia and east to the Rocky Mts. May.

Field note.—The acid berries are edible. On the Overland Trail the emigrants used them in the preparation of a sauce eaten with buffalo meat, whence the name Buffalo Berry. On account of the gray color the small trees in the Mt. Pinos region are sometimes called "Wild Olive".

Locs.—Mono Creek, San Rafael Mts.; Ozena, Cuyama River, n. Ventura Co.; San Emigdio Potrero near Mt. Pinos, *Hall* 6392; Rancho Verde, Victorville, *Fosberg* 8201; Mono Lake, *Brewer* 1849; Markleeville, *Hall & Chandler* 4765.

Refs.—SHEPHERDIA ARGENTEA Nutt. Gen. 2:240 (1818); Jepson, Man. 664, fig. 651 (1925). *Hippophaë argentea* Pursh, Fl. 115 (1814), type loc. "Missouri River", *Lewis. Lepargyrea argentea* Greene, Pitt. 2:122 (1890).

LYTHRACEAE. Loose-strife Family

Glabrous herbs with entire simple leaves. Flowers perfect, axillary or whorled, in ours minute or inconspicuous. Calyx tubular, free from but enclosing the ovary, 4 to 6-toothed, sometimes with accessory teeth in the sinuses. Petals 4 to 6, inserted with the stamens on the calyx. Stigmas in ours 4 to 8. Ovary and capsule in ours 2 to 4-celled; style 1; stigma capitate, 4-lobed. Seed without endosperm.—Genera 21 and species 360, all continents but absent from the colder regions.

Bibliog.—Koehne, A., Lythraceae monog. describuntur (Engler, Bot. Jahrb. 1:142–178, 240–266, 305–335, 436–458,—1881; 2:136–176, 395–429,—1882; 3:129–155, 319–352,—1882; 4:12–37, 386–431,—1883; 5:95–132,—1884; 6:1–48,—1885; 7:1–61,—1886). Lythraceae (Engler, Pflzr. 4^{216}:1–326, figs. 1–59,—1903). Greene, E. L., Genus Lythrum in Cal. (Pitt. 2:11–13,—1889).

Flowers subsessile or pediceled, solitary in the axils; calyx cylindrical; leaves alternate.................. 1. Lythrum.

Flowers sessile in the axils, 2 to 4 in a whorl; calyx campanulate or globose; leaves opposite.

Capsule bursting irregularly, its walls not striate; leaves sessile by an auricled base................ 2. AMMANNIA.
Capsule septicidally dehiscent, its valves densely and very finely striate transversely; leaves tapering at base or shortly petioled..3. ROTALA.

1. **LYTHRUM** L. LOOSE-STRIFE

Slender herbs with 4 or 5-angled stems. Leaves in ours alternate, their blades sessile. Flowers solitary in the axils, purple or whitish. Calyx cylindric or subcylindric, 8 to 12-ribbed, its 4 to 6 teeth thin, erect, smaller than the greenish accessory ones which are at first spreading and later erect. Petals 4, 5 or 6, the stamens in ours as many. Capsule oblong or cylindrical, 2-celled.—Species about 26, all continents. (Greek luthron, blood, applied either on account of the color of the flowers or the styptic properties of certain species.)

Flowers distinctly pediceled; corolla 2 to 3 lines long, bright purple; perennial..1. *L. californicum.*
Flowers subsessile; corolla ½ to 1 line long, pale purple or almost white.
  Perennial, stoloniferous..2. *L. adsurgens.*
  Annual, not stoloniferous..3. *L. hyssopifolia.*

1. **L. californicum** T. & G. CALIFORNIA LOOSE-STRIFE. Stems erect, paniculately branching above, 2 to 3 or even 6 feet high; leaf-blades linear-lanceolate, the lowest ovatish-oblong, ½ to ¾ or 1½ inches long; flowers distinctly pediceled; calyx narrowly vase-shaped or in fruit clavate, 2½ to 3½ lines long, its teeth sharply acute; petals 2 to 3 lines long, bright purple.

Low and marshy lands or about foothill springs, 5 to 4000 feet: throughout California, mostly cismontane. May-Aug.

Locs.—Putah Creek, near Winters, *Jepson* 14,099; Alamo Creek, Vacaville, *Jepson* 14,098; Suisun Marshes, *Jepson* 14,101; Jarvis Ldg., near Newark, *Jepson* 14,100; Milpitas, *R. J. Smith;* Palo Alto, *C. F. Baker* 173; Ione, *Braunton* 1011; Bouldin Isl., lower San Joaquin River, *K. Brandegee;* San Luis Obispo, *Roadhouse;* Three Rivers, *Culbertson* 4227; Delano (10 mi. w.), *Davy* 2423; Tehachapi, *H. L. Bauer;* Piute Creek, e. Mohave Desert, *N. C. Wilson;* Mono Flat, Santa Barbara Co., *A. L. Grant* 1692; Ballona Creek, Los Angeles Co. coast, *Abrams* 2962; Pacoima Cañon, San Gabriel Mts., *Peirson* 291; San Bernardino, *Parish;* Elsinore Lake, *Parish* 4395; Escondido, *Chandler* 5381; Witch Creek, *Alderson;* Cuyamaca Mts., *Wiggins* 2677.

Refs.—LYTHRUM CALIFORNICUM T. & G. Fl. 1:482 (1840), type from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. 324 (1901), ed. 2, 271 (1911), Man. 664 (1925). *L. sanfordii* Greene, Pitt. 2:12 (1889), type loc. Stockton, *Sanford.*

2. **L. adsurgens** Greene. WALLOW POLY. Stems several from the root-crown, decumbent or assurgent, 1 to 3 feet long; herbage pallid, slightly succulent; calyx cylindric, 2 to 2½ lines long, 12-ribbed, the ribs in maturity widened and thickened below; accessory teeth minute, subulate; petals pale purple or almost white, minute (½ to ¾ line long).

Low wet spots or beds of former winter pools of valleys and mountain flats, 5 to 2500 feet: Siskiyou Co.; Sacramento Valley; south to the Santa Clara Valley. May-Aug.

Tax. note.—Lythrum adsurgens is more depressed than is L. hyssopifolia. The succulent stems are a feature of L. adsurgens, but sometimes they are not succulent nor markedly angled, and sometimes again they are not stoloniferous. In several respects it seems like a robust perennial state of L. hyssopifolia. Howell (Fl. Nw. Am. 217) says it ranges north to Puget Sound.

Locs.—Yreka, *Butler* 404; Chico, *Heller* 11,471; College City, *Alice King;* Howell Mt., *Chandler* 7100; Cannon, Solano Co., *Jepson* 14,096; Petaluma, *Palmer* 2399; Lagunitas, Marin Co., *Jepson* 2480d; Berkeley, *H. A. Walker* 430; Black Mt., Santa Clara Co. (Muhl. 3:76).

Refs.—LYTHRUM ADSURGENS Greene, Pitt. 2:12 (1889), type loc. West Berkeley, *Greene;* Jepson, Fl. W. Mid. Cal. 324 (1901), ed. 2, 272 (1911), Man. 664 (1925).

3. **L. hyssopifolia** L. GRASS POLY. Stems erect, slender and simple or with several branches from below the middle, 4 to 9 inches or even 2 feet high; herbage pale, glabrous; leaf-blades linear to oblong, 3 to 7 lines long; flowers subsessile in the axils; calyx 2 lines long; petals ¾ to 1 line long, pale purple or whitish.

Hillside hollows or beds of former vernal pools, 5 to 2500 feet: cismontane California. Widely scattered over the earth, occurring in all continents. May-Sept.

Locs.—Sierra Nevada foothills: Auburn, *Shockley;* Kentucky House, South Fork Calaveras River, *Jepson* 10,039; Burson, Calaveras Co., *Jepson* 9944; Chinese Camp, *Jepson* 6317; Bowers Cave, Coulterville, *Jepson* 14,089. Sacramento Valley: Redding, *Baker & Nutting;* Corning, Tehama Co., *Blankinship;* Chico, *Dutton.* Coast Ranges: Willow Creek, Trinity River, *Tracy* 3471; Petrolia, s. Humboldt Co., *Jepson* 2146; Laytonville, n. Mendocino Co., *Jepson* 9321; Pudding Creek, Fort Bragg, *Ottley* 1524; Ukiah Valley, *Jepson* 9283; Potter Valley, Mendocino Co., *Purpus;* Knights Valley, Sonoma Co., *Jepson;* Howell Mt., *Jepson* 14,085; Yountville, Napa Valley, *Jepson* 14,084; Ross Valley, Marin Co., *Jepson* 14,087; Richmond, *Jepson* 9734; Berkeley, *Jepson* 6812; Newark, *Jepson;* Belmont, *Davy* 777; New Almaden, *Davy* 365; Gilroy grade, e. side Santa Cruz Mts., *Jepson* 14,086; Pacific Grove, *Jepson* 14,090. S. Cal.: Ramona, *Wiggins* 2588; San Diego, *Orcutt.*

Refs.—Lythrum hyssopifolia L. Sp. Pl. 447 (1753), type European; Jepson, Fl. W. Mid. Cal. 324 (1901), ed. 2, 272 (1911), Man. 664, fig. 652 (1925).

2. AMMANNIA L.

Annuals with mostly 4-angled stems. Leaves opposite, their blades sessile by an auricled base. Flowers purplish, 1 to 5 in each axil. Calyx campanulate (in fruit globose or nearly so), the tube 8-ribbed, 4-toothed and usually with small accessory teeth in the sinuses. Petals 4, purplish, small and deciduous, or wanting. Stamens in ours 4, inserted below the middle of the calyx-tube. Capsule globose, bursting irregularly.—Species about 19, all continents, but mostly in warm or tropical regions. (Johann Ammann, a German botanist of the 18th century.)

1. **A. coccinea** Rottb. Valley Red-stem. Erect, simple or branching below, ⅓ to 3½ feet high; leaf-blades horizontally spreading, broadly linear or somewhat narrowed towards the apex, 1 to 2½ inches long, sessile by a broad auricled base; flowers in whorls of 2 to 5; petals purple, roundish, ½ to 1 line long, fugacious; calyx in flower narrowly campanulate, strongly 8-ribbed, in fruit globose-distended and the ribs less obvious; capsule 2 lines long; style ⅔ line long.

Muddy shores or river lowlands, 5 to 1500 feet: Lake Co.; Great Valley; Southern California. East to New Jersey, south to Brazil. May-June.

Field note.—The flooding of fields in the Sacramento Valley for rice has favored the multiplication of this native species, making it much more common than it has been heretofore. By rice growers both Ammannia coccinea and Rotala ramosior are considered weeds (P. B. Kennedy, Univ. Cal. Agr. Exp. Sta. Bull. 356:487, 493). When mature the entire plant above ground tends to be red.

Locs.—Willows, Glenn Co., *Jepson* 10,663; Grimes, Colusa Co., *Roy Schirber;* Kelsey Creek near Clear Lake, *Blankinship;* Cache Creek, *Brewer* 2647; lower Sacramento River, *Jepson* 14,083 (Ryer Isl.), 14,082 (Grand Isl.); Stockton, *Davy* 1184; San Joaquin Bridge near Banta, *Bioletti;* Los Banos, *M. S. Jussel;* Visalia (Contrib. U. S. Nat. Herb. 4:102); Needles, *Jepson* 5192; Palo Verde Valley, *Jepson* 5270; Ft. Yuma, *Parish* 8324; Los Alamitos, Orange Co., *Condit;* Lakeside, San Diego Co., *Hall* 7444.

Refs.—Ammannia coccinea Rottb. Pl. Hort. Havn. Descr. 7 (1773), locality not given; Jepson, Fl. W. Mid. Cal. 324 (1901), ed. 2, 272 (1911), Man. 665 (1925). *A. latifolia* T. & G. Fl. 1:480 (1840), not L. (1753).

3. ROTALA L.

Annuals similar to Ammannia. Flowers 1 or 2 in each axil. Petals in ours 4. Stamens 4. Capsule septicidal, its valves microscopically striate transversely.—Species about 32, warm and tropical regions, all continents. (Latin rota, wheel, the leaves whorled in some species.)

1. **R. ramosior** Koehne. Lowland Tooth-cup. Slender, 2 to 3 (or 7) inches high; leaf-blades linear-oblanceolate, tapering at base and thus sometimes short-petioled, 4 to 7 lines long; flowers 1 to 3 in each axil; petals ovate, acuminate, ⅔ line long; stigma subsessile.

Moist lowlands, 5 to 200 feet: San Joaquin Valley. Widely distributed in North and South America. June-July.

Locs.—Stockton, *Sanford;* Los Banos, *M. S. Jussel;* Visalia (Contrib. U. S. Nat. Herb. 4:102).

Refs.—ROTALA RAMOSIOR Koehne; Mart. Fl. Bras. 13^2:194 (1875); Jepson, Man. 665 (1925). *Ammannia ramosior* L. Sp. Pl. 120 (1753), type loc. Virginia, *Clayton. Ammannia humilis* Michx. Fl. Bor. Am. 1:99 (1803), type loc. North Carolina; Jepson, Fl. W. Mid. Cal. 325 (1901), ed. 2, 272 (1911).

ONAGRACEAE. Evening Primrose Family

Herbs. Leaves simple, entire, toothed, lobed or divided. Flowers mainly showy, borne in spikes or racemes, or solitary. Ovary completely inferior, the calyx commonly prolonged beyond it into a calyx-tube (or hypanthium-tube). Sepals, petals and stamens borne on the summit of the calyx-tube, or rarely on the summit of the ovary when the calyx-tube is absent. Calyx-lobes 4 (sometimes 5 or 2). Petals 4 (sometimes 5 or 2), the stamens as many or twice as many. Pollen commonly cobwebby. Ovary 4 (sometimes 5 or 2)-celled; style 1; stigma capitate or discoid, or 4-lobed. Fruit a capsule, rarely bur-like or indehiscent. Seeds mostly small, naked or with a tuft of hairs (coma) at apex; endosperm none.—Genera about 26, species about 480, all continents.

Bibliog.—Spach, Eduardo, Onagrarieae (Hist. Nat. Veg. 4:335–416,—1835). Rothrock, J. T., Synopsis of N. Am. Gaurineae (Proc. Am. Acad. 6:347–354,—1864). Broekens, D. J., Über den Stammbaum der Onagraceae (Recueil des travaux botaniques Néerlandais 21:383–515, —1924). Johansen, D. A., Proposed phylogeny of the Onagraceae based primarily on number of chromosomes (Proc. Nat. Acad. Sci. 15:882–885,—1929); The hypostase and seed sterility in Onagraceae (Madroño 1:165–167,—1928); New chromosome numbers in Onagraceae (Am. Jour. Bot. 16:595–597,—1929). Munz, P. A., and Hitchcock, C. L., A study of the genus Clarkia, with special reference to its relationship to Godetia (Bull. Torr. Club 56:181–197,—1929).

A. Calyx-limb divided down to the ovary and persistent on the fruit after flowering; parts of the flowers in 4s or 5s; fruit a capsule (indehiscent in no. 1).

Petals 5, 6 to 7 lines long; fruit at length reflexed........1. JUSSIEUA.
Petals none or minute; fruit erect........2. LUDWIGIA.

B. Calyx-limb deciduous after flowering.

Parts of the flowers in 4s.
- Fruit a capsule, dehiscent.
  - Ovary 4-celled; calyx-tube produced above the ovary.
    - Seeds with a tuft of hairs at one end.
      - Flowers large; corolla and calyx scarlet........3. ZAUSCHNERIA.
      - Flowers small; corolla white, red or purplish........4. EPILOBIUM.
    - Seeds naked.
      - Anthers innate (attached at or near the base); flowers purple, rose-color or white, never yellow.
        - Calyx-lobes erect or ascending; petals small or minute........5. BOISDUVALIA.
        - Calyx-lobes reflexed or the tips remaining united and turned to one side in anthesis.
          - Petals distinctly clawed, often much lobed; stamens 8 or 4..6. CLARKIA.
          - Petals sessile, not lobed (except in one species); stamens 8..7. GODETIA.
      - Anthers versatile (attached near the middle); flowers yellor or white........8. OENOTHERA.
  - Ovary 2-celled; calyx-limb divided down to the ovary; flowers white......9. GAYOPHYTUM.
- Fruit indehiscent........10. GAURA.

Parts of the flowers in 2s; fruit bur-like........11. CIRCAEA.

1. JUSSIEUA L.

Glabrous perennial herbs, ours aquatic or of muddy shores. Leaves alternate. Flowers yellow, solitary in the axils, pediceled. Calyx divided down to the summit of the ovary, its lobes 5. Petals 5. Stamens twice as many. Fruit (in ours) 5-celled. Seeds very numerous.—Species 36, tropical regions, all continents save Europe. (Bernard de Jussieu, who founded the natural system of classification.)

1. **J. californica** Jepson. Yellow Water-weed. Stems 1 to 10 feet long; leaf-blades oblong to obovate, ⅞ to 2 inches long, the floating ones elliptic or

orbicular and with longer petioles; calyx-lobes lanceolate, ½ inch long; petals broadly obovate, 6 to 7 lines long; fruit woody, cylindric, 10 lines long, indehiscent, at length reflexed and the calyx-lobes deciduous from the mature fruit; fruiting pedicel ½ to ¾ inch long; seeds large for the family, with a very thick tough outer coat.

Rivers, creeks and lakes, 5 to 1500 feet: widely scattered in cismontane California. June-Aug.

Locs.—Coast Ranges: Clear Lake, Lake Co., *Jepson* 14,375; Monte Rio, Sonoma Co., *Charlotte Hoak;* Warm Sprs., w. Alameda Co., *Jepson* 14,377; Pajaro Hills, Monterey Co., *Chandler* 460. Great Valley: Cache Slough, Solano Co., *Jepson* 14,376; Ryer Isl., Solano Co., *Jepson* 14,378; Old River, San Joaquin Co., *Jepson* 10,031; Grayson, San Joaquin River, *Jepson* 10,290; Los Banos, *M. S. Jussel;* Four-mile Slough, Fresno Co., *Jepson* 13,316; Lemon Cove, Tulare Co., *Jepson* 559; Bakersfield, *Davy* 2431. Tuolumne Co.: (?)Mountain Pass, *Grant* 790 (herbage hirsute). S. Cal.: Bixby Lake, Los Angeles Co., *K. Brandegee;* Fullerton, *Hall* 3288; Compton, *Condit;* Riverside, *Hall.*

Refs.—JUSSIEUA CALIFORNICA Jepson, Fl. W. Mid. Cal. 326 (1901), ed. 2, 273 (1911), Man. 666, fig. 653 (1925). *J. repens* var. *californica* Wats.; B. & W. Bot. Cal. 1:217 (1876), type loc. Clear Lake, Cache Creek, *Bolander* 2645. *Ludwigia diffusa* var. *californica* Greene, Fl. Fr. 227 (1891). *J. diffusa* Greene, Man. Reg. S. F. Bay 138 (1894); not J. diffusa Forsk. (1775).

2. LUDWIGIA L.

Aquatic or marsh perennial herbs, with the aspect of Jussieua, but the leaves (in ours) opposite, parts of the flower in 4s, and the petals often absent. Calyx-tube none. Stamens as many as the petals and alternate with them. Ovary broad at apex and usually flattened, or crowned with a conical style-base. Capsule 4-celled, dehiscent by lateral slits or terminal pores. Seeds minute.—Species 20, all continents. (C. G. Ludwig, 1709–1773, Professor of Botany at Leipsic.)

Fruit broadly oblong, tuberculate, 1½ to 2½ lines long……1. *L. palustris.*
Fruit inversely pyramidal, smooth, 3 to 3¾ lines long……2. *L. natans.*

1. **L. palustris** Ell. WATER-STRIFE. Stems 6 to 12 inches long; herbage glabrous; leaf-blades obovate, acute or acuminate, narrowed at base into a rather long petiole, the whole leaf 8 to 13 lines long; petals none, or minute and reddish; capsules erect, broadly oblong, 1½ to 2 lines long, more or less 4-sided or -angled, a narrow longitudinal band of low tubercles on each side, yellowish, the persistent sepals green.

Muddy shores or overflowed lands, 300 to 2800 feet: North Coast Ranges from Sonoma Co. to Siskiyou Co.; Butte Co. East to the Atlantic, north to Canada, south to South America; Europe. July-Aug.

Locs.—Coast Ranges: Glen Ellen, Sonoma Co., *Michener & Bioletti* 707a; Healdsburg, *Alice King;* Cold Creek, Kelseyville, *Blankinship;* Lakeport, *Jepson;* Scott Creek, Lake Co., *Tracy* 2381; Trinity River Valley near the South Fork, *Tracy* 7765; Oro Fino, Siskiyou Co., *Butler* 1791. Butte Co.: Oroville, *Heller* 11,683.

Refs.—LUDWIGIA PALUSTRIS Ell. Sketch Bot. S. C. & Ga. 1:211 (1821); Jepson, Fl. W. Mid. Cal. 326 (1901), ed. 2, 273 (1911), Man. 666 (1925). *Isnardia palustris* L. Sp. Pl. 120 (1753), "in Galliae, Alsatiae, Russiae, Virginiae fluviis".

2. **L. natans** Ell. MARSH-STRIFE. Stems simple or branched, diffuse, ½ to 1½ feet long; herbage glabrous; leaves ⅔ to 2⅓ inches long, the blades ovate or obovate, acute or obtuse, narrowed at the base to a petiole; sepals ovate-acuminate, 2 lines long; petals white, ⅔ to 1 line long; capsules 3 to 3¾ lines long, rust-color, inversely pyramidal, 4-sided, the faces with a shallow median groove; pedicels ⅔ to 1½ lines long.

Streams and marshes, 1000 to 1500 feet: San Bernardino Valley. East to Florida and North Carolina, south to Mexico. June-Aug.

Loc.—Ludwigia natans, widely distributed beyond our borders, was first discovered in California by Parish in the San Bernardino Valley in 1881. This appears to remain still the only known locality for our region.

Refs.—LUDWIGIA NATANS Ell. Sketch Bot. S. C. & Ga. 1:581 (1821), type loc. Barnwell district, S. C. *Isnardia natans* Small, Bull. Torr. Club 24:177 (1897).

3. ZAUSCHNERIA Presl

Low perennials with large scarlet Fuchsia-like flowers. Leaves alternate (the lowest opposite), subsessile or sessile. Calyx above the ovary colored like the corolla, its tube funnelform with a globose base (nectar-bearing within), and appendaged within at the most constricted portion with several erect and deflexed scales. Calyx-lobes 4, erect. Petals 4, obcordate or 2-cleft, inserted on the summit of the calyx-tube and rather shorter than the calyx-lobes. Stamens 8, exserted, colored like the corolla; anthers linear-oblong, attached by the middle. Style long and exserted; stigma 4-lobed. Capsule linear, obtusely 4-angled, 4-valved and imperfectly 4-celled. Seeds oblong, with a tuft of hairs at the apex.—Species 3, western North America. (M. Zauschner, a Bohemian botanist, one time Professor of Natural History in the University of Prague.)

Zauschneria is represented in California by numerous variable forms, many of which have been published as species by various authors. In the Manual of the Flowering Plants of California, 1925, these forms were united into three main phases which were designated as species. While intermediates exist, these species approximate natural entities, both on morphological grounds and by reason of the geographic distribution. This solution of the problem, an acceptance of three species, was followed by Hilend in 1929.

Bibliog.—Greene, E. L., The species of Zauschneria (Pitt. 1:23–28,—1887). Moxley, Geo. L., Two new Zauschnerias (Bull. S. Cal. Acad. 15:22,—1916); Notes on Zauschneria (l.c. 15:47–54,—1916); A study in Zauschneria (Southwest Sci. Bull. 1:13–29, pls. 2–4,—1920); Further notes on Zauschneria (Bull. S. Cal. Acad. 20:54–55,—1921). Hilend, Martha, A revision of the genus Zauschneria (Am. Jour. Bot. 16:58–68,—1929).

Leaf-blades linear to linear-lanceolate, the lateral veins commonly not evident; calyx-tube not veiny or not markedly so.
  Petals exceeding calyx-lobes; leaves (1 or) 1½ to 4 lines wide.........................1. *Z. californica.*
  Petals shorter than calyx-lobes; leaves ¼ to 1 line wide..2. *Z. cana.*
Leaf-blades ovate to ovate-lanceolate, 4 to 9 lines wide, the lateral veins usually obvious; calyx-tube commonly with prominent longitudinal veins..3. *Z. latifolia.*

1. **Z. californica** Presl. MEXICAN BALSAMEA. Stems decumbent or suberect, ½ to 2½ feet high, usually simple and leafless below, but leafy and commonly with short opposite branches above; bark tending to exfoliate below; herbage green-pubescent, often a little glandular; leaf-blades linear or lanceolate-linear, entire or somewhat denticulate, greenish or canescent, ½ to 1¼ inches long, the lateral veins usually not evident; flowers 1 to 1½ inches long above ovary, disposed in few-flowered spikes.

Dry benches, rocky hillsides or cliffs, 50 to 8000 feet: Coast Ranges from Mendocino and Lake Cos. to San Luis Obispo Co.; Sierra Nevada foothills from Mariposa Co. to Tulare Co.; coastal Southern California. South to Lower California. July-Oct.

Locs.—Coast Ranges: Piercy, South Fork Eel River, nw. Mendocino Co., *Jepson* 9474; Weldon Cañon, Vaca Mts., *Jepson* 14,427; Yountville, Napa Co., *F. L. Clark;* Agua Caliente, Sonoma Co., *Jepson* 6193; Mt. Tamalpais, *Jepson* 9508; Berkeley, *Jepson* 9827; Mt. Diablo, *Jepson* 9515; Los Buellis Hills, Mt. Hamilton Range, *R. J. Smith;* New Almaden, Santa Clara Co., *Davy* 359; Carmel Bay, *Elmer* 4039; Santa Lucia Creek, Santa Lucia Mts., *Jepson* 4749; San Luis Obispo, *Summers.* Sierra Nevada: Wawona (Clarks), Mariposa Co., *Bolander* 5014; Mono Ranger Mdw., South Fork San Joaquin River, *Jepson* 13,187; Whittaker Forest, Tulare Co., *E. D. Merrill.* Coastal S. Cal.: Ojai Valley, *Olive Thacher;* Arroyo Seco, Los Angeles, *E. D. Palmer;* West Fork San Gabriel River, *Peirson* 280; San Bernardino Mts., *Parish;* Trabuco Cañon, Santa Ana Mts., *Munz* 7764; Palomar Mt., *Esther Hewlett.*

Var. villosa Jepson. Herbage white-tomentose; leaf-blades usually narrowly linear.—Rocky cliffs and ridges, 20 to 1000 feet: Humboldt Co. to Solano and Alameda Cos.; coastal Southern California. June-Oct.

Locs.—South Fork Trinity River, Humboldt Co., *Tracy* 5942; Richardson Grove, South Fork Eel River, *Jepson* 10,652; Lake Co., *Greene;* Calistoga, *Jepson* 14,429; Tolenas Sprs., Vaca Mts., *Jepson* 14,430; Berkeley Hills, *Jepson* 6195. The Southern California representatives of this variety, although similar in pubescence to the plants just cited, have narrower leaves and form a more homogeneous group, although mainland representatives are more or less intermediate toward the species: Santa Barbara, *Elmer* 4012; Santa Rosa Isl., *T. Brandegee;* Freys Harbor, Santa Cruz Isl., *A. L. Grant* 1732; Santa Catalina Isl., *Condit;* San Clemente Isl., *T. Brandegee;* San Luis Rey River (mouth), San Diego Co., *Hall* 12,294; Escondido, *C. V. Meyer* 258.

Refs.—ZAUSCHNERIA CALIFORNICA Presl, Rel. Haenk. 2:28, t. 52 (1831), type loc. Monterey, *Haenke;* Jepson, Fl. W. Mid. Cal. 327 (1901), ed. 2, 274 (1911), Man. 667, fig. 654 (1925). *Z. eastwoodae* Eastw. & Moxley, Southwest Sci. Bull. 1:23 (1920), type loc. Los Gatos, *Heller* 7211 (vidi typ.) Var. VILLOSA Jepson, Man. 667 (1925). *Z. villosa* Greene, Pitt. 1:27 (1887), type loc. Santa Cruz Isl., *Greene.*

2. **Z. cana** Greene. GRAY BALSAMEA. Leaves fascicled in the axils, the blades linear or linear-filiform, 3 to 10 lines long; herbage tomentose-canescent, not glandular.

Dry hills near the coast, 50 to 2000 feet: San Luis Obispo Co. to Los Angeles Co.; Santa Barbara Islands. July-Dec.

Locs.—San Luis Obispo, *B. Cobb;* Santa Monica, *Barber* 39; Griffith Park, Los Angeles, *Braunton* 717; Echo Mt., San Gabriel Mts., *Peirson* 279; Santa Anita Cañon, San Gabriel Mts., *J. T. Howell* 3148; Santa Cruz Isl., *Greene;* Anacapa Isl., *H. Hemphill.* The above spms. represent the extreme form; a series of broader-leaved less canescent intermediates connects this species with Z. californica.

Refs.—ZAUSCHNERIA CANA Greene, Pitt. 1:28 (1887), type loc. Santa Cruz Isl., *Greene* (vidi typ.); Jepson, Man. 667 (1925). *Z. californica* var. *microphylla* Gray; B. & W. Bot. Cal. 1:218 (1876), type from S. Cal. *Z. microphylla* Moxley, Southwest Sci. Bull. 1:22 (1920).

3. **Z. latifolia** Greene. MOUNTAIN BALSAMEA. Stems 4 to 14 inches high; herbage green, thinly villous, often viscid; leaf-blades ovate, oblong-ovate or elliptical, usually rounded at base, commonly denticulate, lateral veining usually evident, ¾ to 1¾ inches long; flower above ovary 10 to 16 lines long.

Rocky slopes and cañons, 5000 to 8500 feet: coastal Southern California from western Riverside Co. to northern Ventura Co.; Sierra Nevada from Kern Co. to Lassen Co.; North Coast Ranges from Mendocino Co. to Humboldt Co. East to Nevada, north to Oregon. June-Sept.

Locs.—Coastal S. Cal.: El Toro Peak, Santa Rosa Mt., *Hall* 763; Strawberry Valley, Mt. San Jacinto, *Hall* 2503; Mt. San Gorgonio, *Geo. B. Grant;* Lake Arrowhead, San Bernardino Mts., *Braunton* 1046; Swartout Cañon, San Antonio Mts., *Munz* 7710; Mt. Gleason, San Gabriel Mts., *Barber* 252; Alamos Mt., Ventura Co., *Hall* 6708. Tehachapi Mts.: Tehachapi, *Wolf* 1684; Breckenridge Mt., *Bauer* 5. Sierra Nevada: Kern Cañon, Tulare Co., *Culbertson* 4280; Alder Creek, Kaweah River, *W. Fry* 321; Sawmill Cañon, w. Inyo Co., *Peirson* 759; Mt. Silliman, Tulare Co., *K. Brandegee;* betw. Palisade Creek and Simpson Mdw., Fresno Co., *E. Ferguson* 521; McKinley Big Trees, *A. L. Grant* 1185; Shadow Lake, Middle Fork San Joaquin River, *A. L. Grant* 1565; Snow Creek, Yosemite, *Jepson* 4379; Iron Cañon, Stanislaus River, *W. J. Williamson* 296; Glen Alpine, Eldorado Co., *Abrams* 12,724; Webber Peak, Sierra Co., *Lemmon;* Indian Valley, Plumas Co., *R. M. Austin* 559; Susanville, *Pearl Safford.* North Coast Ranges: Castle Peak, ne. Mendocino Co., *Jepson* 14,431; Trinity Summit, n. Humboldt Co., *Tracy* 5288.

Var. **tomentella** Jepson. Herbage white-villous; leaf-blades ovate to lanceolate, 8 to 15 lines long; flower above ovary 10 to 12 lines long.—Montane, 4000 to 9300 feet: Sierra Nevada from Plumas Co. to Tulare Co. July-Oct.

Locs.—Genesee Valley, Plumas Co., *Jepson* 8019; Rich Pt., Middle Fork Feather River, *Jepson* 10,607; Mt. Tallac, Lake Tahoe, *Jepson* 8131; Ebbetts Pass, Alpine Co., *Brewer* 2034; Kennedy Mdw., Tuolumne Co., *A. L. Grant* 919; Yosemite, *J. B. Lembert;* Little Kern River, Tulare Co., *Purpus* 5226.

Var. **viscosa** Jepson. Herbage extremely viscid; leaf-blades ovate, abruptly acute.—Dry rocky slopes and ridges, 5000 to 8500 feet: San Gabriel and San Jacinto mountains. June-Sept.

Locs.—Betw. Mt. Lowe and Mt. Wilson, *Peirson* 123; Ontario Peak, San Gabriel Mts., *Munz* 6088; Strawberry Valley, Mt. San Jacinto, *Jepson* 2325; betw. Fern Valley and Tahquitz, San Jacinto Mts., *Munz* 6363.

Refs.—ZAUSCHNERIA LATIFOLIA Greene, Pitt. 1:25 (1887); Jepson, Man. 667 (1925). *Z. californica* var. *latifolia* Hook. Bot. Mag. t. 4493 (1850), type cult., loc. unknown, collector probably *Menzies;* Jepson, Fl. W. Mid. Cal. 327 (1901), ed. 2, 274 (1911). *Z. glandulosa* Moxley, Bull. S. Cal. Acad. 15:22 (1916), type loc. ridge s. of Strawberry Valley, San Jacinto Mts., *W. W. Swarth* (Moxley's no. 460). *Z. velutina* Eastw. Southwest Sci. Bull. 1:25 (1920), type loc. Russian River, n. of Cloverdale, *Heller* 5829. *Z. elegans* Eastw. Southwest Sci. Bull. 1:26 (1920), type loc. Kern Cañon, *Culbertson* 4220. *Z. pulchella* Moxley, Southwest Sci. Bull. 1:27 (1920), type loc. Willoughby Mine, Gold Lake region, Plumas Co., *E. C. Sutliffe.* *Z. pulchella* var. *adpressa* Moxley, Bull. S. Cal. Acad. 20:54 (1921), type loc. Salmon Lake, Sierra Co., *E. C. Sutliffe.* *Z. orbiculata* Moxley, Bull. S. Cal. Acad. 19^{4}:30 (1920), type loc. Saw Mill Cañon, Inyo Co., e. slope Sierra Nevada, *Peirson* 759. *Z. californica* var. *johnstonii* Hilend, Am. Jour. Bot. 16:67 (1929), type loc. 6 mi. se. of Poppet Flat, San Jacinto Mts., *Munz & Johnston* 8836. Var. TOMENTELLA Jepson, Man. 667 (1925). *Z. tomentella* Greene, Pitt. 1:26 (1887), type loc. Yosemite. *Z. canescens* Eastw. Southwest Sci. Bull. 1:29 (1920), type loc. South Fork Kaweah River, *Culbertson* 4502. Var. VISCOSA Jepson, Man. 667 (1925). *Z. viscosa* Moxley, Bull. S. Cal. Acad. 15:22 (1916), type loc. summit of ridge near Barley Flats, San Gabriel Mts., *Moxley* 412. *Z. hallii* Moxley, Southwest Sci. Bull. 1:27 (1920), type loc. ridge w. side San Jacinto Mts., *Hall* 2567 (vidi typ.).

4. **EPILOBIUM** L. WILLOW HERB

Herbs; annual, perennial by creeping rootstocks, or propagating in the autumn by offsets. Leaves opposite or alternate. Flowers purple, rose-color or white, borne in racemes or panicles. Calyx-tube short or none. Sepals 4. Petals 4, often emarginate or bifid. Stamens 8, the 4 alternate shorter. Stigma oblong or 4-lobed. Ovary long and narrow, 4-celled. Capsule 4-valved. Seeds numerous, the summit bearing a tuft of long hairs (coma).—Species about 160, all continents. (Greek epi, upon, lobus, a pod, and ion, a violet.)

Bibliog.—Haussknecht, C., Epilobia nova (Oesterr. Bot. Zeitschr. 29:89–91,—1879); Monographie der Gattung Epilobium, 1–318, t. 1–23 (1884). Trelease, W., A revision of the Am. species of Epilobium occurring north of Mexico (Rep. Mo. Bot. Gard. 2:69–117, pls. 1–48,—1891). Léveillé, H., Iconographie du genre Epilobium, 1–328, pls. 1–272 (1910–1911). Fernald, M. L., American variations of Epilobium, sect. Chamaenerion (Rhod. 20:1–10,—1918); Some Am. Epilobiums of the sect. Lysimachion (Rhod. 20:29–39,—1918).

A. Petals entire, 5 to 9 lines long, spreading, slightly irregular, flowers large; calyx divided down to the ovary or nearly, the tube none or almost none; style at first recurved; stigma 4-cleft; capsules long-pediceled; leaves alternate; perennials with stout horizontal rootstocks.—Subgenus CHAMAENERION.

Racemes many-flowered, elongate, not leafy; petals purple; leaves green above but pale and veiny below........1. *E. angustifolium.*
Racemes few-flowered, short, very leafy; petals rose-color; leaves pallid and veinless on both surfaces........2. *E. latifolium.*

B. Petals deeply notched or obcordate, ascending, regular; calyx deeply divided, the tube usually short but always evident; style not curved.—Subgenus LYSIMACHION.

- Perennials; leaves opposite or mainly so (often more or less alternate in no. 10).
  - Flowers large, the petals ½ to 1 inch long; stigma with oblong lobes; low plants.
    - Leaves 3 to 5 lines long (except var.), crowded; calyx-tube 1½ to 2 lines long; alpine or high montane, Sierra Nevada, and Siskiyou and Trinity Cos...3. *E. obcordatum.*
    - Leaves 1 to 1½ inches long, discrete; calyx-tube ½ line long; low hills, Del Norte Co.....4. *E. rigidum.*
  - Flowers small, the petals 1 to 6 lines long; stigma entire or rarely lobed.
    - Leaves tipped with a brown subulate gland; stem arising from a short woody caudex; xerophilous........5. *E. nivium.*
    - Leaves not gland-tipped; usually springy or boggy ground.
      - Plants pallid, glabrous and glaucous........6. *E. glaberrimum.*
      - Plants green and not at all glaucous.
        - Rootstocks not producing fleshy-scaly buds.
          - Stems 2 to 12 inches high, simple, stoloniferous; high montane.
            - Leaves more or less spreading.
              - Stems many from a much-branched root-crown; leaves elliptic to narrow-ovate, thickish, 3 to 4 lines wide........7. *E. anagallidifolium.*
              - Stems few to many from a slender horizontal rootstock; leaves elliptic to oblong-ovate, very thin, 5 to 8 lines wide........8. *E. alpinum.*
            - Leaves ascending or strictly erect, linear to ovate-oblong, 3 to 8 lines long........9. *E. oregonense.*
          - Stems 1 to 4 feet high, almost always branched above, not stoloniferous; foothills and lower valleys.

Stems reddish; leaves mainly opposite; petals 3 to 5 lines long; coastal........10. *E. watsonii.*
Stems greenish or light-colored; leaves opposite or the upper mostly alternate; petals 1½ to 2½ lines long; mostly interior........11. *E. californicum.*
Rootstocks producing fleshy-scaly globose winter buds; plants simple-stemmed; herbage commonly glabrous........12. *E. brevistylum.*
Annuals; stems with shreddy bark; xerophilous plants.
Plants 2 inches to 1½ feet high, more or less pubescent; stem simple or equally branched throughout; calyx-tube less than ½ line long; leaves opposite........13. *E. minutum.*
Plants 1½ to 5 feet high, glabrous, at least below; stem paniculately branched above; calyx-tube 1 to 2 lines long........14. *E. paniculatum.*

1. **E. angustifolium** L. PURPLE FIRE-WEED. Stem erect, mostly simple, 2 to 7 feet high, glabrous, or puberulent above; leaf-blades lanceolate, nearly entire, lateral veins confluent in submarginal loops, 4 to 6 inches long, sessile or nearly so, or the lower short-petioled; flowers large, in long racemes with small slender bracts; corolla slightly irregular, lilac-purple; petals 5 to 8 lines long, entire or slightly emarginate; stamens purple, in a single row, with filaments dilated at base; style exceeding the stamens, hairy at base, at first recurved; capsule 2 to 3 inches long.

Moist or boggy ground, in cleared lands or along creeks, and especially in fire-swept areas: mountains of coastal Southern California, 6500 to 9000 feet; Sierra Nevada from Tulare Co. to Modoc Co., 4700 to 10,000 feet; White Mts.; North Coast Ranges from Sonoma Co. to Del Norte Co., 20 to 3000 feet. Northern North America, Europe, Asia. June-Aug.

Locs.—S. Cal.: Cuyamaca, *T. Brandegee;* Tahquitz Valley, San Jacinto Mts., *Hall* 723; Pine Lake, San Bernardino Mts., *R. D. Williams;* Prairie Fork, San Gabriel River, *Peirson* 2506. Sierra Nevada: North Fork Middle Tule River, *Jepson* 4699; Giant Forest, Tulare Co., *Newlon* 22; Palisade Creek, Fresno Co., *E. Ferguson* 509; Huntington Lake, *Jepson* 13,060; Kennedy Mdw., Tuolumne Co., *A. L. Grant* 172; Rock Creek, Mono Co., *Almeda Nordyke;* Dorrington, Calaveras Co., *Jepson* 10,197; Big Mdws., Plumas Co., *Platt;* Mineral, Tehama Co., *J. Grinnell;* Martin Sprs., Eagle Lake, *Brown & Wieslander* 37; Coyote Creek, Warner Mts., *L. S. Smith* 1063; Ft. Bidwell, *Jepson* 7915. White Mts., *A. C. Shelton.* North Coast Ranges: Russian River sta., Sonoma Co., *Alice Bolton;* Pt. Arena, *Bioletti;* Ft. Bragg, *Jepson* 14,443; Richardson Grove, Garberville, *Jepson* 10,654; Weott, South Fork Eel River, *Jepson* 12,360; Big Lagoon, Humboldt Co., *Tracy* 7755; Crescent City, *Parks* 8384.

Var. **pygmaeum** Jepson var. n. Dwarf, 6 to 7 inches high; leaf-blades narrow-lanceolate, acuminate, 1 to 1¾ inches long; petals white, 2½ to 3 lines long.—(Nanum, unc. 6–7 altum; folia anguste lanceolata, acuminata, unc. 1–1¾ longa; petala alba, lin. 2½–3 longa.)—Taboose Pass, Inyo Co., 10,500 feet, *Peirson* 2538 (type).

Refs.—EPILOBIUM ANGUSTIFOLIUM L. Sp. Pl. 347 (1753), type from northern Europe; Jepson, Man. 668, fig. 665 (1925). *E. spicatum* Lam. Fl. Fr. 3:482 (1778), type from France. *Chamaenerion spicatum* S. F. Gray, Nat. Arr. Brit. Pl. 2:559 (1821). Var. PYGMAEUM Jepson.

2. **E. latifolium** L. ALPINE FIREWEED. Stems several to many, commonly simple, erect or ascending from the short branches of the root-crown, ½ to 2 feet high, puberulent above; leaf-blades lanceolate to elliptic-ovate, rather coriaceous, glaucous and veinless on both surfaces, entire, sessile or nearly so, ¾ to 2 inches long; racemes short, few-flowered, leafy; petals rose-color, 6 to 10 lines long; style much shorter than the stamens; stigma-lobes oblong; capsules 2 to 3 inches long.

Wet ground, subalpine, 8000 to 9000 feet: easterly summits or east side of the Sierra Nevada in Tuolumne and Mono Cos. North to Alaska, east to Colorado and Labrador; Europe, Asia. Sept.

Locs.—Deadman's Creek, near Sonora Pass, *A. L. Grant* 387; Lundy, Mono Co., *Maud Minthorn.*

Refs.—EPILOBIUM LATIFOLIUM L. Sp. Pl. 347 (1753), type from Siberia; Jepson, Man. 668 (1925). *Chamaenerion latifolium* Sweet, Hort. Brit. ed. 2, 198 (1830).

3. **E. obcordatum** Gray. SIERRA ROCK-FRINGE. ROSE EPILOBIUM. Stems simple, decumbent, several from the slightly soft-woody base, 2 to 4 (or 6) inches long; herbage glabrous and frequently glaucous, or the stems and sometimes the

leaves minutely puberulent; leaves crowded or approximate, the blades ovate, evidently denticulate, 3 to 5 lines long, sessile or very shortly petiolate; racemes very short, 1 to 4-flowered, borne in the axils of the scarcely reduced upper leaves; calyx-tube 1½ to 2½ lines long, 1 to 2 lines wide, the lobes 2 to 5 lines long; petals bright rose-purple, roundish-obovate, obcordately 2-lobed, (4 or) 6 to 10 lines long; anthers yellow, on purplish filaments; style purplish; ovary 4 to 8 lines long, linear or only slightly bulging; capsules 10 to 20 lines long, comparatively few-seeded.

Alpine or subalpine slopes, 6800 to 13,000 feet: Sierra Nevada from Tulare Co. to Modoc Co. July-Sept.

Locs.—Sierra Nevada: Farewell Gap, Tulare Co., *Jepson* 1021; Mt. Whitney, *Burton & Ryerson* 45; Lyell Fork, Merced River, *Blasdale;* Mt. Leavitt, Tuolumne Co., *A. L. Grant* 436; Carson Pass, *Jepson* 8119; Castle Peak (Mt. Stanford), Nevada Co., *Sonne;* Brokeoff Mt., Tehama Co., *J. Grinnell;* Mt. Bidwell, Modoc Co., *Jepson* 7877; Mt. Shasta (N. Am. Fauna 16:155).

Var. laxa Dempster comb. n. Leaf-blades larger (4 to 13 lines long), acute both at base and apex; calyx-tube usually shorter for its width than in the species.—Siskiyou and Trinity Cos.; Placer Co. The leaves (shape, dentation), ovary, capsules and well-developed calyx-tube ally this variety to Epilobium obcordatum, rather than to E. rigidum, which it nevertheless approaches.

Locs.—Woolly Creek, Siskiyou Co., *Butler* 46; Mt. Eddy, Siskiyou Co., *Copeland* 3857; Bear Creek (head of), Trinity Co., *Alexander & Kellogg* 312; Tinker's Knob, Placer Co., *Sonne;* Summit sta. (high mts. s.), Placer Co., *Sonne.*

Refs.—EPILOBIUM OBCORDATUM Gray, Proc. Am. Acad. 6:532 (1866), type loc. Squaw Valley, Tahoe region, *Brewer;* Jepson, Man. 669 (1925). *E. obcordatum* f. *compacta* Hausskn. Monog. Epilob. 251 (1884), type loc. not given. *E. obcordatum* var. *puberulum* Jepson, Man. 669 (1925), type loc. Silver Pass, Fresno Co., *A. L. Grant* 1534. Var. LAXA Dempster. *E. obcordatum* f. *laxa* Hausskn. Monog. Epilob. 251 (1884), type loc. not given.

4. **E. rigidum** Hausskn. CREEK-FRINGE. Stems decumbent or ascending, several from the slightly soft-woody base, 4 to 8 (or 10) inches long; herbage pallid, glabrous or microscopically puberulent; leaves discrete, the blades elliptic-ovate, acute at both ends, apparently entire, but minutely denticulate, (½ or) 1 to 1½ inches long, drawn down to a short petiole; flowers few, in short (1 to 1½ inches) leafy-bracteate racemes; calyx-tube ½ line long, 1½ lines broad at apex, the lobes 5 to 7 lines long; petals rose-purple, roundish-obcordate, 9 to 10 lines long; ovary 3 to 4 lines long, commonly spindle-shaped; capsules 8 to 12 lines long, on pedicels 3 lines long.

Dry stream-beds, 500 to 1600 feet: northern Del Norte Co. Northeast to Josephine Co., Oregon. Aug.

Locs.—Del Norte Co.: Hurdy Gurdy Creek, near Gasquet, *M. S. Baker* 289b; 18-Mile Creek (mouth of), *Tracy* 10,886. Ore.: Siskiyou Mts. (base of), *Cusick* 2938; Waldo, *T. Howell.*

Refs.—EPILOBIUM RIGIDUM Hausskn. Oesterr. Bot. Zeitschr. 29:51 (1879), "Coast Range, Lat. 42°", that is, near the boundary between Curry Co., Ore., and Del Norte Co., Cal.; Trel. Rep. Mo. Bot. Gard. 2:82, pl. 5 (1891).

5. **E. nivium** Bdg. Stems erect, tufted on a shortly branched woody root-crown, 5 to 10 inches high; herbage finely short-villous; leaf-blades elliptic to linear or lanceolate, coriaceous and not at all veiny, entire, a subulate brown gland at apex, 3 to 7 lines long, narrowed to a short petiole; racemes few-flowered, the subtending leaves much reduced; calyx-tube 2½ to 3½ lines long; petals violet-purple, notched at the apex, 3 to 5 lines long; stigma 4-notched; capsule stoutish, 5 to 6 lines long.

Shaly slopes, 6000 to 8000 feet: inner North Coast Range from northern Lake Co. to northeastern Mendocino Co. Sept.

Locs.—Snow Mt., n. Lake Co., *T. Brandegee;* St. Johns Peak, ne. Lake Co., *W. W. Mackie;* Castle Peak, ne. Mendocino Co., *Jepson* 14,469.

Refs.—EPILOBIUM NIVIUM Bdg. Zoe 3:242, pl. 24 (1892), type loc. Snow Mt., Lake Co., *T. Brandegee;* Jepson, Man. 669 (1925).

6. **E. glaberrimum** Barbey. CLIFF COTTONWEED. Stems slender, erect, unbranched or occasionally with a few short striet laterals, (½ or) 1 to 3 feet high,

arising from branching scaly rootstocks; herbage pallid, glabrous, very glaucous; leaf-blades oblong-lanceolate to linear, entire or essentially so, 1 to 2½ inches long, mostly rather closely ascending, sessile or the lowermost very short-petiolate; petals pale lavender or nearly white, 2 to 4 lines long.

Springy ground or clefts of cliffs in the mountains, 3000 to 10,000 feet: mountains of coastal Southern California; Sierra Nevada from Tulare Co. to Siskiyou Co.; Trinity Co. North to Washington. June-July.

Locs.—S. Cal.: San Diego Co., *Gregory;* Mt. San Jacinto, *Mary Spencer;* Icehouse Cañon, San Gabriel Mts., *Peirson* 124; Prairie Fork, San Gabriel River, *Peirson* 2499; Glen Martin, San Bernardino Mts., *D. L. Crawford;* Middle Creek, Mt. Pinos, *Hall* 6643. Sierra Nevada: Little Kern River, *Purpus* 5152; Coyote Pass, Kern Cañon, *Jepson* 978; Wawona, *Congdon;* Stubblefield Cañon, Tuolumne Co., *Jepson* 4566; Kennedy Lake, Tuolumne Co., *A. L. Grant* 209; Silver Valley, Alpine Co., *Jepson* 10,102; Cascade Lake, Tallac, Eldorado Co., *C. J. Fox Jr.;* Donner Lake, *Sonne* 111; Rich Pt., Middle Fork Feather River, *Jepson* 10,620; Chico Mdws., Butte Co., *Heller* 11,601; Susanville, *Pearl Safford;* Morgan Sprs., Tehama Co., *Jepson* 12,322; Mt. Shasta, *Jepson* 14,467.

Refs.—EPILOBIUM GLABERRIMUM Barbey; B. & W. Bot. Cal. 1:220 (1876), type loc. Yosemite Valley, *Bolander;* Jepson, Man. 669 (1925). *E. fastigiatum* subsp. *glaberrimum* Piper, Contrib. U. S. Nat. Herb. 11:404 (1906). *E. glaberrimum* var. *fastigiatum* Trel. Rep. Mo. Bot. Gard. 2:105, pl. 39 (1891); Jepson, Man. 669 (1925). *E. affine* var. *fastigiatum* Nutt.; T. & G. Fl. 1:489 (1840), type loc. "plains of the Oregon", *Nuttall. E. fastigiatum* Piper, Contrib. U. S. Nat. Herb. 11:404 (1906). *E. glaberrimum* var. *latifolium* Barbey; B. & W. Bot. Cal. 1:220 (1876), type loc. Sierra Co., *Lemmon. E. platyphyllum* Rydb. Bull. Torr. Club 40:63 (1913).

7. **E. anagallidifolium** Lam. PURPLE COTTONWEED. Stems simple, many, forming a diffuse or erect tuft, 2½ to 6 inches long, arising from the numerous slender branches of the root-crown; herbage glabrous or the stems with pubescent lines; leaf-blades elliptic or oblong to narrow-ovate, obtuse, entire, 2 to 6 lines long, contracted to a short but distinct petiole; racemes nodding a little at first; petals lilac, red or purple, 1 to 1½ lines long; racemes maturing 1 to 4 capsules.

High montane, 9000 to 10,400 feet: Tulare Co.; Modoc Co. East to Colorado, north to arctic America; Europe, Asia. Aug.

Locs.—Farewell Gap, *Purpus* 5668; Eagle Peak, Warner Mts., *Jepson* 7979.

Refs.—EPILOBIUM ANAGALLIDIFOLIUM Lam. Encyc. 2:376 (1788), type loc. "Mont-d'Or" [Plomb du Cantal, Auvergne Mts., France]; Jepson, Man. 669 (1925).

8. **E. alpinum** L. ALPINE COTTONWEED. Stems slender, erect, simple, few to many from a slender rootstock, 4 to 12 inches high, stoloniferous; herbage glabrous; leaf-blades elliptic or oblong-ovate, mostly obtuse, entire or obscurely denticulate, very thin, bright green and glabrous, ¾ to 1½ inches long, narrowed to a petiole 1 to 2 lines long, somewhat spreading; petals white or pink, 1½ to 2½ lines long; racemes maturing 1 to 6 (or 9) capsules.

Wet woods, 6000 to 9000 feet: Sierra Nevada from Tulare to Siskiyou Co. North to Alaska, east to Labrador; Europe. June-Aug.

Locs.—Soda Creek, Sawtooth Range, *Purpus* 2018; Alta Mdws., Tulare Co., *K. Brandegee;* Mt. Silliman, *K. Brandegee;* Lake Merced, Merced River, *Jepson* 4424; Carson Pass, *Jepson* 8112; Donner Lake, *Heller* 7044; Long Lake, Plumas Co., *Hall* 9323; Medicine Lake, e. Siskiyou Co., *M. S. Baker* 509; Mt. Shasta, *Brewer* 1417.

Refs.—EPILOBIUM ALPINUM L. Sp. Pl. 348 (1753), type from Alps, Switzerland; Jepson, Man. 669 (1925). *E. lactiflorum* Hausskn. Oesterr. Bot. Zeitschr. 29:89 (1879), "hab. in maxima parte Scandinaviae, in Lapponia, Islandia, Kamtschatka, Sitka, Unalaschka, Grönlandia, Labradoria usque ad terram Hudsonicam".

9. **E. oregonense** Hausskn. OREGON COTTONWEED. Stems simple, slender, erect, 3 to 6 (or 9) inches high, 1 or few from a slender rootstock, the leaves more or less crowded below, reduced and sparse above; herbage glabrous; leaf-blades linear to oblong or ovate-oblong, usually obtuse, sessile with a more or less rounded base, usually entire or rarely obscurely denticulate, 3 to 8 lines long; petals cream-

color or pink, deeply emarginate, 2 to 3½ lines long; racemes maturing usually 1 to 4 capsules.

Boggy ground in the higher mountains, 5300 to 8000 feet: San Jacinto and San Bernardino mountains; Sierra Nevada from Fresno Co. to Mt. Shasta; Yollo Bolly Mts. East to Nevada, north to British Columbia. June-July.

Locs.—S. Cal.: Tahquitz Valley, San Jacinto Mts., *Condit;* Bluff Lake, San Bernardino Mts., *Munz* 10,621. Sierra Nevada: Bullfrog Lake, Bubbs Creek, Fresno Co., *Jepson* 840; Mono Hot Sprs., Fresno Co., *E. Ferguson* 427; Westfall's Mdw., Mariposa Co., *Bolander* 4965; Mt. Shasta, *Jepson* 14,470. Yollo Bolly Mts.: South Yollo Bolly, *Jepson* 14,471.

Refs.—Epilobium oregonense Hausskn. Monog. Epilob. 276 (1884), type from Ore., *Hall* 179; Jepson, Man. 669 (1925).

10. **E. watsonii** Barbey. Coast Cottonweed. Stems rather stout, erect, simple below though more or less branched above, usually reddish, shortly pilose-pubescent and sometimes glandular above, 2 to 4 feet high, producing in the late fall rosettes of foliage leaves that are sessile at the base of the stem or on short scaly shoots; leaves prevailingly opposite, the blades oblong-lanceolate to narrowly ovate, serrulate, the base round with a short petiole or subsessile, commonly about 2 (1 to 3) inches long; racemes very floriferous, leafy, elongate; petals red-purple or paler, deeply emarginate, 3 to 5 lines long.

Along the coast, 10 to 500 feet: San Luis Obispo Co.; Sonoma Co. June-July.

Locs.—San Carpoforo, San Luis Obispo Co., *Condit;* Pitkin Marsh, Vine Hill region, Sonoma Co., *M. S. Baker* 3199c; Bodega Head, *K. Brandegee.*

Var. **franciscanum** Jepson. Herbage glabrate; inflorescence densely compact or loose.—Low or moist ground near the coast: Monterey Co. to Del Norte and Siskiyou Cos. North to Washington. June-Aug.

Locs.—Willow Creek, Santa Lucia Mts., *Plaskett;* Pajaro Hills, n. Monterey Co., *Chandler* 414; Crystal Springs Lake, San Mateo Co., *Elmer* 4962; Mt. Davidson, San Francisco, *Jepson* 10,591; Mt. Tamalpais, *Jepson* 9510; Bodega Bay, *M. S. Baker* 3513; Humboldt Bay, *Tracy* 2591; Pebble Beach, Del Norte Co., *Parks* 3139; Shackelford Creek, Siskiyou Co., *Butler* 159.

Refs.—Epilobium watsonii Barbey; B. & W. Bot. Cal. 1:219 (1876), type loc. near Fort Ross, Sonoma Co.; Jepson, Man. 669 (1925). Var. franciscanum Jepson, Man. 670, fig. 656 (1925). *E. franciscanum* Barbey; B. & W. Bot. Cal. 1:220 (1876), type loc. San Francisco, *Bigelow.*

11. **E. californicum** Hausskn. California Cottonweed. Stem slender, commonly simple below, branched above, not colored, 2 to 4 feet high, remotely leafy; herbage glabrous or whitish-pubescent above; leaf-blades lanceolate or oblong-lanceolate, denticulate, 1 to 3 inches long, short-petioled or subsessile, passing into the small floral ones; flowers small; petals white, 1 to 1½ lines long; capsule slender, nearly glabrous, short-pedicelled.

About springs and along streams, 20 to 5200 feet: coastal Southern California; Coast Ranges; Delta region; Sierra Nevada; White Mts. May-Sept.

Locs.—S. Cal.: San Diego River Falls, *T. Brandegee;* Palomar Mt., *Esther Hewlett* 67; Strawberry Valley, San Jacinto Mts., *Hall* 2378; Los Angeles, *E. D. Palmer;* Santa Cruz Isl., *Frida Niedermüller;* Santa Paula, Ventura Co., *Cobb* 130. Coast Ranges: Carmel River, near Carmel Mission, *Jepson* 14,446; Stanford, *C. F. Baker* 3290; Mt. Tamalpais, *Jepson* 14,463; Guerneville, Sonoma Co., *Condit* 224; Howell Mt., Napa Co., *Jepson* 14,465; Weldon Cañon, Vaca Mts., *Jepson* 14,459; Russian River, *Davy* 4136; Knoxville grade to Lower Lake, *Jepson* 14,451; Blue Lakes, Lake Co., *Jepson* 14,453; Big Horse Mt., n. Lake Co., *Jepson* 14,452; Ft. Bragg, *W. C. Mathews;* near Richardson Grove, South Fork Eel River, Humboldt Co., *Tracy* 5046; Martin ranch, South Fork Trinity River, *Jepson* 2017; Klamath River, Humboldt Co., *Chandler* 1530; Hennessey Road, South Fork Trinity River, *Tracy* 7704 (flowers larger, 3 lines long); Sisson, Siskiyou Co., *Jepson* 14,450; Yreka Creek, Siskiyou Co., *Butler* 1598. Delta region: Grand Isl., *Jepson* 14,448; Suisun Marshes, *Jepson* 14,444. Sierra Nevada: Giant Forest, *Newlon;* Markwood Mdw., Fresno Co., *Jepson* 16,047; Clover Mdw., s. of Timber Knob, Madera Co., *Kennedy;* Bear Valley, Nevada Co., *Jepson* 14,445; Jess Valley, Warner Mts., *Jepson* 7946. White Mts.: Silver Cañon, *Jepson* 7412.

Var. **occidentale** Jepson. Pubescence slightly glandular on the branches.—Mountains and valleys, widely distributed: San Bernardino Mts., *Chandler;* Three Rivers, Tulare Co., *Culbertson* 4225; Berkeley, *H. A. Walker* 403; Eureka, *Tracy* 3075; Meadow Valley, Plumas Co., *Jepson* 10,638.

Var. **parishii** Jepson. Buds white-tomentose.—Moist ground, meadows or swamps or along streams, 5 to 1500 (or 4200) feet: coastal Southern California. South to Lower California. May-Nov.

Locs.—Noble Mine, San Diego Co., *Chandler* 5482; San Jacinto Valley, *G. F. Reinhardt;* San Bernardino Valley, *Parish* 7163; Ballona Marsh, *Chandler* 2037; Topango, Los Angeles Co., *Barber.*

Var. **holosericeum** Jepson. Canescent throughout with a dense short pubescence.—Moist ground, 5 to 1500 feet: throughout cismontane California.

Locs.—S. Cal.: El Cajon, San Diego Co., *K. Brandegee;* Newport Beach, Orange Co., *J. T. Howell* 3178; Nigger Slough, Los Angeles Co., *Braunton* 496; San Bernardino, *Parish* 1022; Chino, San Bernardino Co., *Condit.* Sierra Nevada: Kern Co. (Rep. Mo. Bot. Gard. 2:92); Three Rivers, Tulare Co., *K. Brandegee;* Ione, Amador Co., *Braunton* 1114; Oroville, Butte Co., *Heller* 11,568. Great Valley: Bouldin Isl., San Joaquin Co., *K. Brandegee;* Middle River, San Joaquin Co., *Congdon;* Alamo Creek, nw. Solano Co., *Jepson* 14,460; Chico, *H. A. Dutton.* North Coast Ranges: Blue Lakes, Lake Co., *Jepson* 14,457; Sharber Slough, Trinity River, Trinity Co., *Tracy* 7785.

Refs.—EPILOBIUM CALIFORNICUM Hausskn. Monog. Epilob. 260 (1884), type loc. Ft. Ross, *Wrangell;* Jepson, Man. 670 (1925). *E. coloratum* B. & W. Bot. Cal. 1:219 (1876) and *E. adenocaulon* of Cal. authors probably belong here. Var. OCCIDENTALE Jepson, Man. 670 (1925). *E. adenocaulon* var. *occidentale* Trel. Rep. Mo. Bot. Gard. 2:95, pl. 23 (1891), "Vancouver Isl. and British Columbia to central California and Nevada?". *E. occidentale* Rydb. Mem. N. Y. Bot. Gard. 1:275 (1900). Var. PARISHII Jepson, Man. 670 (1925). *E. parishii* Trel. Rep. Mo. Bot. Gard. 2:97, pl. 27 (1891), type loc. San Bernardino, *Parish* 2094, 2095. *E. adenocaulon* var. *perplexans* Trel. Rep. Mo. Bot. Gard. 2:96 (1891), in part. *E. palmeri* Lévl.; Fedde, Rep. 5:98 (1908), type loc. Cuyamaca Mts., *Palmer* 5368. Var. HOLOSERICEUM Jepson, Man. 670 (1925). *E. holosericeum* Trel. Rep. Mo. Bot. Gard. 2:91, pl. 17 (1891), type loc. San Bernardino, *Parish* 1022.

12. **E. brevistylum** Barbey. PINE COTTONWEED. Stems erect, simple or usually at most with one or two inconspicuous laterals above, 1 to 1⅔ or occasionally 2½ feet high; rootstocks producing globose or ovoid winter buds, the scales of which are thick and fleshy and which frequently persist as a series of cotyledon-like scales at the base of the stem developing from the bud; herbage glabrous or often finely pubescent; leaf-blades narrow-ovate to oblong- or linear-lanceolate, finely serrulate, sessile with rounded base, ascending or suberect, mostly 3 to 11 lines wide, 1 to 2¾ inches long; petals purplish or white, emarginate, 1½ to 2½ (or 4) lines long.

Wet ground, mostly in the pine belt, 750 to 8500 feet: coastal Southern California; Sierra Nevada from Tulare Co. to Modoc Co. and eastern Siskiyou Co.; North Coast Ranges. North to Washington, east to Colorado. May-Sept.

Locs.—S. Cal.: Tamarack Valley, San Jacinto Mts., *Hall* 2589; Bluff Lake, San Bernardino Mts., *Parish* 3765; Coldwater Fork of Lytle Creek, San Antonio Mts., *Peirson* 2304; Middle Fork, Mt. Pinos, Ventura Co., *Hall* 6541. Sierra Nevada: Hockett Mdws., Tulare Co., *Hall & Babcock* 5594; McKinley Big Trees, Fresno Co., *Jepson* 16,020; Markwood Mdw., Fresno Co., *Jepson* 16,046; Soda Sprs. of the San Joaquin, *Congdon;* Rancheria Mt., Tuolumne Co., *Jepson* 4609; Dorrington, Calaveras Co., *Jepson* 10,121; Phillips, Eldorado Co., *Helen Geis* 10; Martin Sprs., Eagle Lake, *Brown & Wieslander* 16; Mt. Bidwell, ne. Modoc Co., *Manning;* Mt. Shasta (N. Am. Fauna 16:155). North Coast Ranges: Spruce Grove, n. of Hull Mt., e. Mendocino Co., *Cronemiller* 799; South Fork Mt., Trinity Co., *Tracy* 6505; Bridgeville, Humboldt Co., *Tracy* 6204; Trinity Summit, n. Humboldt Co., *Tracy* 5225.

Note on variation.—The various varieties which have been proposed, resting in part on previously published specific names, were originally segregated on several characters, but with the accumulation of material these characters are seen to be inconstant. In the Sierra Nevada one may find every intermediate from E. brevistylum to the form known as var. ursinum, while the var. pringleanum is simply an extreme in the series, that is, a very slender state with narrow leaves. Individuals representing var. pringleanum and var. tenue may be found in one narrow colony, differing only slightly as to pubescence or the absence of it. Var. exaltatum is robust, branching and large-flowered.

Var. **pringleanum** Jepson. Low, 4 to 6 (or 12) inches high; herbage glabrous or sometimes finely puberulent; leaf-blades linear-oblong or linear-lanceolate, entire or inconspicuously denticulate, 1 to 3 lines wide, 6 to 11 lines long.—Wet soil, 5000 to 7000 feet: Sierra Nevada from Tulare Co. to e. Siskiyou Co.; Humboldt Co. to western Siskiyou Co. North to Washington.

Locs.—Sierra Nevada: Mt. Silliman, Tulare Co., *K. Brandegee;* Little Yosemite, *Hall* 9066; Deer Park, Placer Co., *Helen Geis* 130; Donner Pass, *Heller* 7030; Martin Sprs., Eagle Lake, *Brown & Wieslander* 38; Paynes Sprs., e. Siskiyou Co., *M. S. Baker*. North Coast Ranges: Trinity Summit, Humboldt Co., *Tracy* 5234; Shackelford Cañon, w. Siskiyou Co., *Chandler* 1702.

Var. exaltatum Jepson comb. n. Stems slender; flowers large, the petals becoming 4 to 6 lines long.—Moist ground, 3800 to 7000 feet: Sierra Nevada from Tulare Co. to Amador Co.; Humboldt and Siskiyou Cos. July-Aug.

Locs.—Sierra Nevada: Huckleberry Mdw., Giant Forest, *Newlon* 50; Soquel, Madera Co., *Congdon;* Silver Lake, Amador Co., *Earle Mulliken* 118. Coast Ranges: Grouse Creek, Humboldt Co., *Chesnut & Drew;* Deetz sta., Siskiyou Co., *Heller* 11,712.

Refs.—Epilobium brevistylum Barbey; B. & W. Bot. Cal. 1:220 (1876), type loc. Sierra Co., *Lemmon:* Jepson, Man. 670 (1925). *E. concinnum* Congd. Erythea 7:184 (1899), type loc. "on trail to the Soda Springs of the San Joaquin River", *Congdon*. *E. ursinum* Parish; Trel. Rep. Mo. Bot. Gard. 2:100, pl. 31 (1891), type loc. Bear Valley, San Bernardino Mts., *Parish* 1619. *E. brevistylum* var. *ursinum* Jepson, Man. 670 (1925). Var. PRINGLEANUM Jepson, Man. 670 (1925). *E. pringleanum* Hausskn. Mittheil. Geogr. Gesells. Jena 7:5 (1888), type loc. "mountains about the headwaters of the Sacramento River", *Pringle*. *E. ursinum* var. *subfalcatum* Trel. Rep. Mo. Bot. Gard. 2:101, pl. 32 (1891), type from Cal., *Gray*. *E. delicatum* var. *tenue* Trel. Rep. Mo. Bot. Gard. 2:99, pl. 28 (1891), type loc. Union Co., Ore., *Cusick* 911; not E. tenue Kom. (1905). *E. brevistylum* var. *tenue* Jepson, Man. 670 (1925). Var. EXALTATUM Jepson. *E. exaltatum* Drew, Bull. Torr. Club 16:151 (1889), type loc. Grouse Creek, Humboldt Co., *Chesnut & Drew*. *E. californicum* var. *exaltatum* Jepson, Man. 670 (1925).

13. **E. minutum** Lindl. Chaparral Cottonweed. Stems simple or subsimple and erect, or with many ascending opposite branches, 2 to 16 inches high; herbage puberulent; leaves rather remote, the blades lanceolate, oblanceolate or narrowly oblong, thickish, entire or remotely denticulate, 3 to 10 lines long, tapering to a distinct petiole; flowers distributed along the stem in the axils of the reduced leaves; calyx-tube less than ½ line long; petals pink, rose-color or white, emarginate, ½ to 2½ lines long; capsule arcuate, short-pediceled or even sessile.

Rocky outcrops, pine or oak belts, or in chaparral, 100 to 4500 (or 7000) feet: Sierra Nevada from Mariposa Co. to Modoc Co.; Coast Ranges from San Luis Obispo Co. to Humboldt Co. North to British Columbia. Apr.-June.

Locs.—Sierra Nevada: Snow Creek, Yosemite, *Jepson* 10,494; Yankee Hill, Columbia, *Jepson* 6399; Angels Camp, Calaveras Co., *Davy* 1466; Pilot Hill, Eldorado Co., *K. Brandegee;* Marston sta., Plumas Co., *Heller* 10,844; Burney Falls, Shasta Co., *Baker & Nutting;* Forestdale, Modoc Co., *Baker & Nutting*. Coast Ranges: Perfumo Cañon, San Luis Obispo Co., *E. P. Unangst* 838; Picacho Peak, San Benito Co., *Hall* 9949; Alma, Santa Clara Co., *Heller* 7346; Woodside, San Mateo Co., *C. F. Baker* 749; Mt. Tamalpais, *Jepson* 14,468; Howell Mt., Napa Co., *Tracy* 1499; Mt. St. Helena, *Jepson* 10,374; Ukiah, *Bolander* 3825; Potter Valley, Mendocino Co., *Purpus;* Horse Mt., Humboldt Co., *Tracy* 7617; Kneeland Prairie, Humboldt Co., *Tracy* 2627; Oro Fino, Siskiyou Co., *Butler* 612.

Refs.—Epilobium minutum Lindl.; Hook. Fl. Bor. Am. 1:207 (1834), type from "northwest coast of America", *Menzies;* Jepson, Man. 670 (1925). *Crossostigma lindleyi* Spach, Monog. Nouv. Ann. Mus. Par. ser. 3, 4:328 (1835). *E. adscendens* Suks. Deutsch. Bot. Monatschr. 18:87 (1900), type *Suksdorf* 81, Washington. *E. adscendens* var. *canescens* Suks. l.c., type loc. "Falkenthal, Klickitat Co., Wash.," *Suksdorf* 2147. *E. minutum* var. *canescens* Suks. Deutsch. Bot. Monatschr. 18:87 (1900). *E. congdoni* Lévl.; Fedde, Rep. Nov. Spec. 5:98 (1908), type loc. Sausalito, Marin Co., *Congdon*. *E. minutum* var. *biolettii* Greene, Pitt. 2:296 (1892), type loc. s. slope Mt. Tamalpais beyond Mill Valley, *Bioletti;* Jepson, Man. 671 (1925). *E. minutum* var. *foliosum* T. & G. Fl. 1:490 (1840), type loc. "dry rocks, Oregon and the Rocky Mts. of California", *Nuttall*. *E. foliosum* Suks. Deutsch. Bot. Monatschr. 18:87 (1900).

14. **E. paniculatum** Nutt. Summer Cottonweed. Stem simple below, paniculately branched above, very shreddy, 1½ to 3 or even 6 feet high; herbage glabrous throughout, sometimes glandular-puberulent on the inflorescence; leaves mostly alternate, with smaller ones fascicled in the axils, usually early deciduous; leaf-blades lanceolate to linear, sharply but minutely denticulate, mostly veined, 1¼ to 2½ inches long; flowers many to numerous, racemose on the filiform nearly leafless branches of the panicle, the bracts almost subulate; petals deeply 2-cleft into linear-oblong lobes, rotate-spreading, rose-purple, 3 to 5 lines long; stigma obliquely truncate; capsule pediceled, 10 to 12 lines long, sharply 4-angled and acuminately beaked; seeds warty.

Open dry or moist ground, common nearly everywhere, 10 to 6700 feet: mountains of coastal Southern California; Coast Ranges from San Luis Obispo Co. to

Humboldt Co.; Great Valley; Sierra Nevada from Tulare Co. to Modoc Co. North to British Columbia, east to Colorado and Arizona. June-Sept.

Locs.—S. Cal.: San Jacinto Mts., *Hall* 2627; San Antonio Cañon, San Antonio Mts., *Peirson* 126; Bear Valley, San Bernardino Mts., *Munz* 10,735. Coast Ranges: San Luis Obispo, *Condit;* Mt. San Carlos, *Brewer* 789; Los Buellis Hills, Mt. Hamilton Range, *R. J. Smith;* Stanford, *C. F. Baker* 46; Berkeley, *H. A. Walker* 435; Kenwood, Sonoma Co., *M. S. Baker* 5565; Ukiah, Mendocino Co., *Purdy;* Bull Creek, Humboldt Co., *Jepson* 16,538; Dinsmore ranch, Van Duzen River valley, Humboldt Co., *Tracy* 3959. Great Valley: Tulare, *Davy* 3023; Lathrop, *H. A. Walker* 921; Brannan Isl., Sacramento Co., *Jepson* 10,223; Princeton, Colusa Co., *Chandler.* Sierra Nevada: Giant Forest, Tulare Co., *K. Brandegee;* Mono Mdw., near Mono Hot Sprs., Fresno Co., *A. L. Grant* 1507; betw. Vernal and Nevada Falls, Yosemite, *Abrams* 4597; Ione, Amador Co., *Braunton* 1216; Truckee, *Sonne* 3; Dry Creek, Butte Co., *Heller* 11,689; Doyle, Honey Lake Valley, Lassen Co., *Davy;* Ft. Bidwell, Modoc Co., *Jepson* 7912; Egg Lake, Modoc Co., *M. S. Baker;* Goosenest foothills, Siskiyou Co., *Butler* 1629.

Var. **jucundum** Trel. Herbage often very glaucous; flowers large, the petals 5 to 8 lines long.—Open flats or grassy slopes, 10 to 4400 feet: Coast Ranges from Santa Clara Co. to Humboldt Co.; east to Plumas and Sierra Cos. North to Washington. Aug.-Sept.

Locs.—Gilroy, *Condit;* Suisun, *Heller* 7551; Grouse Mt., Humboldt Co., *Tracy* 4854; Trinity River valley near the South Fork, Humboldt Co., *Tracy* 7273; Etna, Siskiyou Co., *Butler* 156; Big Mdws., Plumas Co., *Cleveland;* Sierra Co. (Rep. Mo. Bot. Gard. 2:86).

Refs.—EPILOBIUM PANICULATUM Nutt.; T. & G. Fl. 1:490 (1890), type loc. "plains of the Oregon and Rocky Mountains," *Nuttall;* Jepson, Man. 671, fig. 657 (1925). *E. paniculatum* f. *adenocaulon* Hausskn. Monog. Epilob. 247 (1884), type from Cal., *Bolander.* Var. JUCUNDUM Trel. Rep. Mo. Bot. Gard. 2:85, pl. 9 (1891); Jepson, Man. 671 (1925). *E. jucundum* Gray, Proc. Am. Acad. 12:57 (1877), type loc. Scott Valley, Siskiyou Co., *Greene. E. paniculatum* f. *tubulosum* Hausskn. Monog. Epilob. 247 (1884), type loc. Vallejo, *Greene.*

5. BOISDUVALIA Spach

Erect annuals with alternate sessile leaves. Flowers small or minute, in leafy spikes or axillary along the branches. Calyx-tube short, obconic, its lobes 4, erect. Petals 4, obovate, sessile, 2-lobed, purple to white. Stamens 8, those opposite the petals shorter; anthers basifixed. Capsule 4-celled, 4-valved, sessile.—Species about 8, western North and South America. (Jean Alphonse Boisduval, French naturalist and physician, author of Flore Française.)

Bibliog.—Watson, S., Revision of the extra-tropical species of the genus Oenothera, sect. Boisduvalia (Proc. Am. Acad. 8:600–601,—1873). Trelease, W., Revision of the N. Am. species of * * * Boisduvalia (Rep. Mo. Bot. Gard. 5:116–122, pls. 23–26,—1894). Léveillé, H., Monographie du genre Onothera: groupe Boisduvalia, 296–339 (1908).

Capsule terete, membranous.
  Capsule septifragal, the septa wholly persistent on the placental axis, which is thus 4-winged.. 1. *B. densiflora.*
  Capsule loculicidal, the septa adherent to the valves in dehiscence.
    Floral leaves ovate or oblong.
      Petals 2 lines long........2. *B. glabella.*
      Petals 4 to 6 lines long........3. *B. macrantha.*
    Floral leaves linear........4. *B. stricta.*
Capsule 4-sided, coriaceous; dehiscence unknown........5. *B. cleistogama.*

1. **B. densiflora** Wats. Stem erect, 1 to 5 feet high, branched above; leaf-blades lanceolate, 1 to 2½ (or 3½) inches long, the floral ovate, acute, about 3 to 6 lines long; inflorescence spicate, commonly elongated; petals about 2 lines long, about twice as long as the sepals, and exceeding the subtending leaves; capsule 2 lines long, dehiscent; seeds ovate or triangular-ovate.

Low ground or pool beds where water formerly stood in spring or winter, 10 to 6000 feet: Southern California mountains; Sierra Nevada from Kern Co. to Modoc Co.; Great Valley; Coast Ranges from San Luis Obispo Co. to Siskiyou Co. North to British Columbia, east to Wyoming, south to Lower California. June-Sept.

Locs.—S. Cal.: Palomar Mt., *Esther Hewlett;* Little Bear Valley, San Bernardino Mts., *Chandler;* Frazier Mt., Ventura Co., *Hall* 6617. Sierra Nevada foothills: Piute Peak, Kern Co., *Purpus* 5294; Three Rivers, Tulare Co., *K. Brandegee;* Pine Ridge, Fresno Co., *K. Brandegee;* Greeley Hill, Coulterville, *Jepson* 14,397; Jones sta., Tuolumne Co., *A. L. Grant* 875; Kentucky House, South Fork Calaveras River, *Jepson* 10,036; Auburn, *Shockley;* Bear Valley, Nevada Co., *Jepson* 14,396; Geneseo Valley, Plumas Co., *Heller* 8863; Montgomery Creek, Shasta Co., *M. S. Baker;* upper Fall River Valley, ne. Shasta Co., *Jepson* 5748; Egg Lake, Modoc Co., *M. S. Baker.* Great Valley: Belleview, Madera Co., *Jepson* 12,905; Stockton, *Sanford* 182; Vanden, Solano Co., *Jepson* 9724. Coast Ranges: San Luis Obispo Valley, *Summers;* Pajaro Hills, Monterey Co., *Chandler* 463; Black Mt., Santa Clara Co., *Elmer* 4769; West Berkeley, *Greene;* Yountville, Napa Co., *Jepson* 14,406; Ukiah, *Jepson* 7635; Mt. Hanna, Lake Co., *Jepson* 14,392; Ft. Bragg, *W. C. Mathews;* Asa Bean Ridge, ne. Mendocino Co., *Jepson* 14,399; Whitethorn Valley, sw. Humboldt Co., *Tracy* 5020; Miranda, Humboldt Co., *Jepson* 12,364; Van Duzen River valley, opposite Buck Mt., *Tracy* 2850; Old Shasta, *Blankinship;* Hornbrook, Siskiyou Co., *E. B. Copeland* 3543.

Var. **imbricata** Greene. Bracts densely imbricated, concealing the capsules; spikes commonly very long and virgate.—Valleys, 100 to 3500 feet: Sierra Nevada foothills from Amador Co. to Butte Co.; Sacramento Valley; Coast Ranges from Santa Cruz Co. to Humboldt Co. There are numerous intergrades to the species.

Locs.—Sierra Nevada: Pioneer, Amador Co., *Hansen* 1475; Campbell Hot Sprs., Sierra Co., *J. A. DeCou* 464; Clear Creek, Butte Co., *H. E. Brown* 111. Sacramento Valley: Knott's Ldg., Andrus Isl., *Jepson* 14,408; Lagoon Valley, Solano Co., *Jepson* 14,402; Hamilton, Glenn Co., *Heller* 11,557. Coast Ranges: Santa Cruz, *Brewer* 811; Berkeley Hills, *Jepson* 14,401; Ross Valley, Marin Co., *Jepson* 14,394; Guerneville, Sonoma Co., *Condit;* Howell Mt., Napa Range, *Jepson* 14,390; Middleton, Lake Co., *M. S. Baker* 2235a; Grouse Mt., Humboldt Co., *Tracy* 4852.

Var. **bipartita** Jepson. Herbage pale, villous; petals white, parted into 2 unequal lobes.—North end of Mt. Hamilton Range.

Refs.—BOISDUVALIA DENSIFLORA Wats.; B. & W. Bot. Cal. 1:233 (1876); Jepson, Fl. W. Mid. Cal. 329 (1901), ed. 2, 276 (1911), Man. 671 (1925). *Oenothera densiflora* Lindl. Bot. Reg. t. 1593 (1833), type from "northern California", *Douglas. B. douglasii* Spach, Hist. Nat. Veg. 4:385 (1835). *Oenothera salicina* Nutt.; T. & G. Fl. 1:505 (1840), "the Wahlamet and Wallawallah", *Nuttall. B. salicina* Rydb. Bull. Torr. Club 40:62 (1913). *B. sparsifolia* Nels. & Ken. Muhl. 3:139 (1908), type loc. Maggie Creek, Elko Co., Nev., *P. B. Kennedy* 644. *B. sparsiflora* Hel. Muhl. 1:42 (1904), type loc. Donner Lake (lower end), *Heller* 7021. Var. IMBRICATA Greene, Fl. Fr. 225 (1891), type loc. San Francisco Bay region; Jepson, Fl. W. Mid. Cal. 330 (1901), ed. 2, 276 (1911), Man. 672 (1925). *B. imbricata* Hel. Muhl. 1:42 (1904). *B. densiflora* var. *montana* Jepson, Fl. W. Mid. Cal. 330 (1901), type loc. Howell Mt., Napa Co., *Jepson* 14,390; ed. 2, 276 (1911); Man. 672 (1925). Var. BIPARTITA Jepson, Fl. W. Mid. Cal. ed. 2, 276 (1911), Man. 672 (1925). *B. bipartita* Greene, Erythea 3:119 (1895), type loc. Arroyo del Valle, se. Alameda Co., *Greene;* Jepson, Fl. W. Mid. Cal. 329 (1901).

2. **B. glabella** Walp. Stem commonly branched from the base, 5 to 9 inches high; herbage glabrous or nearly, the foliage bright green; leaf-blades lanceolate to ovate, 5 to 7 lines long; petals 2 lines long, purple; stamens opposite the sepals 1½ lines long, the alternate ones shorter (sometimes with nearly sessile anthers); capsule almost straight, pointed at apex, 3 lines long; seeds fusiform, about 60.

Flats and beds of former winter pools, 20 to 5000 feet: cismontane Southern California; Coast Ranges; lower San Joaquin Valley; Sacramento Valley; Modoc Co. East to Nevada, north to British Columbia and Montana. June-Aug.

Locs.—Coastal S. Cal.: San Diego, *T. Brandegee;* Palomar Mt., *Mary Spencer;* Menifee Valley, Riverside Co., *Munz & Johnston* 5368. Coast Ranges: San Luis Obispo, *Palmer* 145½; Mt. Eden, Alameda Co., *K. Brandegee;* Mt. Hanna, s. Lake Co., *Jepson* 14,414; Snow Mt., n. Lake Co., *T. Brandegee;* Ukiah, *Heller;* Carlotta, Humboldt Co., *Tracy* 3978; Dobbyn Creek, Humboldt Co., *Tracy* 4726. Great Valley: betw. Oakdale and La Grange, *Jepson* 14,415; Farmington, San Joaquin Co., *Tracy* 5788; Stockton, *Sanford* 32; Antioch, *K. Brandegee;* Little Oak, Vacaville, *Jepson* 14,416; College City, Colusa Co., *Alice King;* Pine Creek road sta., Tehama Co., *Jepson* 12,350. Modoc Co.: Egg Lake, *M. S. Baker;* Tamarack Flat, Mt. Bidwell, *Manning* 337. In plants of the Great Valley, as just cited, the upper portion of the branches is densely imbricated with leaves which in the fruiting stage conceal the capsules (var. campestris Jepson).

Refs.—BOISDUVALIA GLABELLA Walp. Rep. 2:89 (1843); Trel. Rep. Mo. Bot. Gard. 5:117, pl. 23 (1894); Jepson, Man. 672 (1925). *Oenothera glabella* Nutt.; T. & G. Fl. 1:505 (1840), type loc. "plains of the Oregon east of Wallawallah", *Nuttall. B. glabella* var. *campestris* Jepson, Fl. W. Mid. Cal. ed. 2, 276 (1911), Man. 672 (1925). *B. campestris* Jepson, Fl. W. Mid. Cal. 330 (1901), type loc. Little Oak, Vacaville, *Jepson* 14,416.

3. **B. macrantha** Hel. Stems 3 to 16 inches high, erect, simple or branched at the base; herbage glabrous below, villous-pubescent above; leaf-blades lanceolate (or the lower oblanceolate), rather remotely serrulate, ¾ to 1½ inches long; petals rose-purple, cuneate, notched at apex, 4 to 6 lines long; stamens opposite the sepals 3½ lines long, the alternate ones 2½ lines long; capsules villous, slender, straight, 7 to 9 lines long, the apex beak-like; seeds triangular-ovate, 1 line long.

Moist sandy or gravelly soil, 500 to 1100 feet: Butte and Shasta Cos. May-June.

Locs.—Table Mt., Oroville, *Heller* 10,750; Redding (2 mi. ne.), *Heller* 14,395.

Ref.—BOISDUVALIA MACRANTHA Hel. Muhl. 2:101 (1905), type loc. Redding, *Heller* 7906.

4. **B. stricta** Greene. Stems simple or often diffusely branched from the base, frequently flowering from the very base, 5 to 13 inches high, pilose-pubescent or somewhat canescent; branches often with sparse foliage, or the foliage strict; leaf-blades linear, ½ to 1½ inches long; petals violet or white, 1 line long; capsule slender, attenuate, arcuate-recurved, 6 to 7 lines long, not promptly dehiscent.

Dry or moist beds of streamlets or former vernal pools, 50 to 5000 feet: San Jacinto Mts.; Sierra Nevada from Tulare Co. to Modoc Co.; Coast Ranges from Monterey Co. to Humboldt Co. North to Washington and Idaho. June-Aug.

Locs.—S. Cal.: San Jacinto Mts., *G. F. Reinhardt.* Sierra Nevada: Giant Forest, Tulare Co., *K. Brandegee;* Pine Ridge, Fresno Co., *Hall & Chandler* 87; Mt. Bullion, Mariposa Co., *Jepson* 10,728; Harden Ranch, Tuolumne Co., *Jepson* 10,562; Burson, Calaveras Co., *Jepson* 9934; Jackson, *Hansen* 287; Sweetwater Creek, Eldorado Co., *K. Brandegee;* Rose Sprs., Placer Co., *M. H. Gates;* Oroville, *Heller* 11,388; Fall River Sprs., ne. Shasta Co., *Hall & Babcock* 4180; Egg Lake, Modoc Co., *M. S. Baker.* Sacramento Valley: Montezuma Hills, se. Solano Co., *Jepson* 13,498; Little Oak, Vacaville, *Jepson* 14,413; Sacramento, *F. Ramaley;* Cana, Butte Co., *Jepson* 16,613. Coast Ranges: Santa Lucia Mts. (Rep. Mo. Bot. Gard. 5:118); New Almaden (Bot. Cal. 1:233); Howell Mt., Napa Co., *Jepson* 14,409; Mt. Hanna, Lake Co., *Jepson* 14,411; Cloverdale, *Bolander* 6535; South Mill Creek, Ukiah, *Jepson* 9275; Blue Lakes grade, Mayacamas Range, *Jepson* 14,410; near Devoy Camp, South Fork Eel River, s. Humboldt Co., *Tracy* 5050; Forks of Dobbyn Creek, Humboldt Co., *Tracy* 4728; Koon Ranch, South Fork Trinity River, Trinity Co., *Tracy* 7705.

Refs.—BOISDUVALIA STRICTA Greene, Fl. Fr. 225 (1891); Trel. Rep. Mo. Bot. Gard. 5:117, pl. 24 (1894); Jepson, Fl. W. Mid. Cal. 330 (1901), ed. 2, 276 (1911), Man. 672 (1925). *Gayophytum strictum* Gray, Proc. Am. Acad. 7:340 (1868), type loc. Cloverdale, *Bolander* 6535. *Oenothera torreyi* Wats. Proc. Am. Acad. 8:600 (1873), "Oregon, (190 *Hall*) and cent. Cal. (Bear Mt., Borax Lake, and New Almaden, *Torrey*)". *B. torreyi* Wats.; B. & W. Bot. Cal. 1:233 (1876). *Oenothera densiflora* var. *tenella* Gray, Proc. Am. Acad. 8:384 (1873), type from Ore., *E. Hall* 189.

5. **B. cleistogama** Curran. Stem commonly with stout rigid whitish branches or rarely simple, 4 to 8 inches high; herbage pilose-pubescent, somewhat glandular, glaucescent; leaf-blades linear or lanceolate, 1 to 1½ inches long, remotely denticulate; flowers axillary along the branches, the earliest fertilized in the bud and never expanding, the later light pink; petals 2 lines long, bifid; capsule 4-sided, sharply angled, sharply pointed, the septal lines on each side distinct, 5 lines long, puberulent, hard-coriaceous, very tardily dehiscent, if ever.

Beds of former vernal pools, 20 to 500 feet: lower San Joaquin Valley; Sacramento Valley. June.

Locs.—Betw. Oakdale and La Grange, *Jepson* 14,418; Farmington, San Joaquin Co., *Tracy* 5787; Antioch, *K. Brandegee;* Elmira, Solano Co., *K. Brandegee;* Butte Creek, betw. Durham and Nelson, Butte Co., *Heller* 11,395.

Refs.—BOISDUVALIA CLEISTOGAMA Curran, Bull. Cal. Acad. 1:12 (1884), type loc. Mt. Diablo, *Curran;* Trel. Rep. Mo. Bot. Gard. 5:121, pl. 26 (1894); Jepson, Fl. W. Mid. Cal. 330 (1901), ed. 2, 277 (1911), Man. 672 (1925).

6. **CLARKIA** Pursh

Annuals with brittle stems and alternate leaves. Flowers showy, in terminal racemes (nodding in the bud). Calyx-tube short and obconical or long and slender, the lobes 4, reflexed in flower, or remaining united and turned to one side. Petals 4, purple or rose-color, with claws, the limb entire or lobed, widespreading. Stamens 8 (those opposite the petals short or rudimentary) or 4. Ovary 4-celled; style elongated, the stigma with 4 broad lobes. Capsule linear, or attenuate above, straight or somewhat curved, coriaceous, with very smooth sides, somewhat 4-angled, 4-valved. Seeds numerous, angled or margined.—The lower leaves in this and in the two succeeding genera often disappear very early.—Species 6, western

North America. (Captain William Clark of the Lewis and Clark party, first expedition across the Rocky Mountains to the Pacific, 1804–1806.)

Stamens 8; calyx-tube short, obconical.
  Petals entire.
    Claw very short, much shorter than limb of petal, often toothed..............1. *C. rhomboidea.*
    Claw about as long as limb of petal, not toothed..2. *C. elegans.*
  Petals 2-lobed with a subulate tooth in the sinus; claw short, not toothed..........3. *C. xantiana.*
Stamens 4; calyx-tube elongated, filiform; petals 3-lobed.
  Petals 3-lobed, the lobes nearly equal..4. *C. concinna.*
  Petals fan-shaped and obcordate, a linear or spatulate lobe proceeding from the deep sinus and exceeding in length the lateral lobes, which are several times larger..................5. *C. breweri.*

1. **C. rhomboidea** Dougl. DIAMOND CLARKIA. Stem erect, 1 to 3 feet high, simple or branching; herbage finely puberulent; leaf-blades oblong to ovate, entire, ½ to 2 inches long, on petioles 1 line to 1 inch long; calyx-tube 1½ lines long; calyx-lobes narrowly linear, carinate; petals rose-purple, often purple-dotted toward the base, rhomboidal, 3 to 5 lines long, the limb with a short broad often toothed claw; filaments with whitish hairy scales at base, those alternate the petals with longer scales; capsule sessile or very shortly pediceled, commonly somewhat curved, appressed-puberulent, 7 to 12 lines long.

Cañon sides or open forest, 500 to 7000 feet: mountains of coastal Southern California; Coast Ranges from San Luis Obispo Co. to Humboldt Co.; Sierra Nevada from Kern Co. to Modoc Co. East to Arizona and South Dakota, north to Washington. May-July.

Locs.—S. Cal.: Descanso, San Diego Co., *K. Brandegee;* Palomar Mt., *Esther Hewlett;* Strawberry Valley, Mt. San Jacinto, *Hall* 2270; Little Bear Valley, San Bernardino Mts., *Chandler;* Mt. Markham, San Gabriel Mts., *Peirson* 2161; Cuddys, Mt. Pinos, *Dudley & Lamb* 4531. Coast Ranges: See Cañon, San Luis Obispo Co., *Condit;* Stone Cañon, Monterey Co., *Condit;* Kelseyville, Lake Co., *Jepson;* Houghs Sprs., ne. Lake Co., *Jepson* 9019; Potter Valley, Mendocino Co., *Nettie Purpus;* Browns Mt., Trinity Co., *H. S. Yates* 394; ridge betw. Van Duzen and Mad rivers, near Low Gap, *Tracy* 2763; Highland Mine, Siskiyou Co., *Butler* 926. Sierra Nevada: Piute Peak, Kern Co., *Purpus* 5298; Giant Forest, Tulare Co., *K. Brandegee;* Bubbs Creek, Kings River Cañon, *Newlon* 225; Yosemite Valley, *Jepson* 8359; Lake Eleanor, Tuolumne Co., *A. L. Grant* 1248; Table Mt., Sonora, *A. L. Grant;* Snowdon ranch, Calaveras Big Trees, *Jepson* 14,421; Colfax, Placer Co., *L. S. Smith* 1629; Nevada City, *Sonne;* Big Mdws., Plumas Co., *Jepson* 4059; Eagle Lake, Lassen Co., *J. Grinnell;* Mineral, Tehama Co., *J. Grinnell;* Dana, ne. Shasta Co., *Hall & Babcock* 4169; Warner Mts., Modoc Co., *Manning* 282.

Refs.—CLARKIA RHOMBOIDEA Dougl.; Hook. Fl. Bor. Am. 1:214 (1834), type loc. "Great Falls of the Columbia (River) to the Rocky Mts.", *Douglas;* Lindl. Bot. Reg. t. 1981 (1837); Jepson, Fl. W. Mid. Cal. 331 (1901), ed. 2, 277 (1911), Man. 673, fig. 659 (1925). *Oenothera rhomboidea* Lévl. Monog. Onoth. 287 (1908), in part. *Phaeostoma rhomboidea* Nels. Bot. Gaz. 52:267 (1911). *C. gauroides* Dougl.; Sweet, Brit. Fl. Gard. ser. 2, t. 379 (1837). *Opsianthes gauroides* Lilja, Fl. Sverig. Suppl. 25 (1840). *Phaeostoma douglasii* Spach, Nouv. Ann. Mus. Par. ser. 3, 4:395 (1835), in part. *C. virgata* Greene, Erythea 3:123 (1895), based upon spms. from Sonoma Co., *Bioletti*, and Amador Co., *Hansen*. *C. rhomboidea* f. *virgata* Munz & Htck. Bull. Torr. Club 56:191 (1929). *Godetia latifolia* Nels. & Ken. Proc. Biol. Soc. Wash. 19:156 (1906), type loc. Sierra Valley, Sierra Co., *Hamlin.*

2. **C. elegans** Dougl. CAÑON CLARKIA. (Fig. 254.) Stem erect, simple or branching, 1 to 3 feet high; herbage glabrous, glaucous, often reddish; leaf-blades ovate to oblong-ovate, entire or repand-denticulate, 1 to 1¾ inches long, short-petioled; calyx-tube 1 to 1½ lines long; calyx-lobes broadly linear, plane; petals pink or purple, often with a spot at base of blade, commonly spreading laterally in pairs, 4 to 8 lines long, the limb about equaling the narrow entire claw; filaments with a reddish densely hairy scale at base, most developed opposite the short stamens; anthers of long stamens bright crimson, 3 lines long; anthers of short stamens commonly white; capsule usually curved, sessile, 7 to 12 lines long, hirsute with spreading hairs.

Cañon sides and chaparral slopes, 200 to 3400 (or 5000) feet: Mendocino Co. to San Luis Obispo Co.; Sierra Nevada foothills from Shasta Co. to Kern Co.; south to the San Gabriel Mts. Mar.-July.

Biol. note.—The deep crimson anthers of the four long stamens open only by a pore beneath the terminal appendage. The white anthers of the four short stamens open their full length. Each filament of both sets has a dense tuft of hairs at the base, so that there appears to be a ring of hairs at the throat. Below this, in the calyx-cup is another ring of hairs, very distinct, but not so dense. The following observations are made in a colony under a Blue Oak (Quercus douglasii) tree standing on a steep slope covered with leaf mold. Bees are visiting the flowers. The bee alights on the protruding white style and stamen cluster and hangs on in this way. The petals spread right and left in pairs and do not interfere with the landing of the bee nor the downward free-swinging of his body. Apparently he feeds on the freely exposed pollen masses of the short white anthers, his hairy body resting on the long anthers. The hairs of the under surface of the body inevitably pick up pollen from the long crimson anthers. These long anthers have the pollen so disposed that the bee could not easily feed from them, but this pollen if carried by the under parts to another flower would be thrust directly against the stigmas of the protruding style which stands directly in the landing area.—Jepson Field Book, upper San Benito River near Lorenzo Creek, June 2, 1927, vol. 46, pp. 43–45 (ms.).

Locs.—Coast Ranges: Mill Creek, Mendocino Co., *Eastwood;* Gates Cañon, Vaca Mts., *Jepson* 14,419; Guerneville, *E. Ferguson* 228; Sonoma Cañon, Kenwood, *Jepson* 10,014; Tamalpais, *K. Brandegee;* Mt. Diablo, *Jepson* 7598; Niles, *Jepson;* Alpine School, San Mateo Co., *Elmer* 4293; Los Gatos Cañon, Santa Clara Co., *Heller* 7482; Boulder Creek, Santa Cruz Co., *H. A. Walker* 748; Carmel Valley, *E. Ferguson* 260; Willow Creek (s. branch), San Benito Co., *Jepson* 12,249; Los Gatos Creek, w. Fresno Co., *Jepson* 12,179; Arroyo Grande, San Luis Obispo Co., *Alice King;* La Panza, *Keck* 2826. Sierra Nevada: betw. Morley sta. and Stevens, Shasta Co., *M. S. Baker* 386; Oroville, *Heller* 10,767; Newcastle, Placer Co., *W. W. Mackie;* New York Ravine, Eldorado Co., *K. Brandegee;* Jackson, *Hansen;* Harmon Peak, Calaveras Co., *Davy* 1414; Parrott Ferry, Stanislaus River, *A. L. Grant;* betw. Tehipite Valley and Gnat Mdw., *E. Ferguson* 532; Trimmer Sprs., Kings River, *H. P. Kelley;* Kaweah, Tulare Co., *Hopping* 190; Springville, Tule River, *Purpus* 1318; Blue Mt., Greenhorn Range, *Hall & Babcock* 5001. Tehachapi Mts.: Bisses sta., *Dudley* 448; Ft. Tejon, *Parish* 2047. S. Cal.: Santa Inez River, Santa Barbara Co., *Hall* 7848; Ojai Valley, Ventura Co., *Olive Thacher* 28; Mandeville Cañon, Santa Monica Mts., *Anderson & Epling;* Tujunga Cañon, San Gabriel Mts., *Peirson* 2086; Icehouse Cañon, San Antonio Mts., *Parish* 11,937.

Refs.—Clarkia elegans Dougl.; Lindl. Bot. Reg. t. 1575 (1833), type from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. 331 (1901), ed. 2, 277 (1911), Man. 673, fig. 660 (1925). *Oenothera elegans* Lévl. Monog. Onoth. 289 (1908). *C. unguiculata* Lindl. Bot. Reg. sub. t. 1981 (1837), type from Cal., *Douglas. Phaeostoma douglasii* Spach, Nouv. Ann. Mus. Par. ser. 3, 4:395 (1835), in part. *P. elegans* Lilja, Fl. Sverig. Suppl. 25 (1840). *C. eiseniana* Kell. Proc. Cal. Acad. 7:94 (1877), type loc. "near Fresno," *Eisen.*

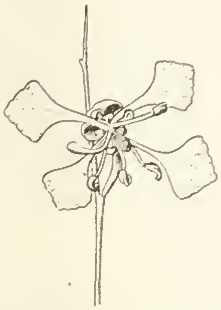


Fig. 254. Clarkia elegans Dougl.; fl., × 1.

Clarkia pulchella Pursh, Fl. 260, pl. 11 (1814), type loc. "on the Kooskoosky and Clark's rivers" (now Kamiah, Ida.), *Lewis;* Jepson, Man. 673 (1925). Petals lilac, deeply 3-lobed, the claw with a tooth on each side; stamens dimorphic, four sterile with rudimentary anthers, and four with fertile anthers, the filaments bearing a scale on each side at base.—Oregon to British Columbia and South Dakota. Greene (Fl. Fr. 223) cites it from Plumas Co., Cal., but probably erroneously.

3. **C. xantiana** Gray. Tejon Clarkia. Stem 1 to 2¼ feet high; herbage glabrous, glaucous; petals broadly obcuneate, contracted below to a broad claw, pink, 2-lobed, with a subulate lobe in the sinus, 6 to 8 lines long; capsule slender, rather strict and nearly straight, puberulent, 10 to 11 lines long.

Dry loose soil, hill slopes, 3400 to 7500 feet: Greenhorn Range; Tehachapi Mts.; Mt. Pinos region; San Gabriel Mts. May-June.

Locs.—Greenhorn Range, *Hall & Babcock* 5084. Tehachapi Mts.: Caliente, *K. Brandegee;* Ft. Tejon, *Parish* 1898. Mt. Pinos region: Frazier Mt., *Hall* 6599. San Gabriel Mts.: Rock Creek, *Peirson* 3535; Cucamonga Mt. (Bull. Torr. Club 56:193).

Refs.—Clarkia xantiana Gray, Proc. Bost. Soc. Nat. Hist. 7:146 (1861), type loc. Ft. Tejon, *Xantus de Vesey* 31; Jepson, Fl. W. Mid. Cal. 332 (1901), ed. 2, 277 (1911), Man. 673 (1925). *Phaeostoma xantiana* Nels. Bot. Gaz. 52:267 (1911). *C. parviflora* Eastw. Bull. Torr. Club 30:492 (1903), type loc. Kernville, Kern Co., *T. Brandegee. Phaeostoma parviflora* Nels. Bot. Gaz. 52:267 (1911).

4. **C. concinna** Greene. Red Ribbons. Stems simple below or diffusely much branched from the base, ½ to 2 feet high; herbage nearly glabrous; leaf-blades

ovate-oblong to oblong, ¾ to 1½ inches long; calyx-tube 7 to 8 (or 11) lines long; calyx-lobes crimson, linear-lanceolate, 9 lines long, abruptly recurved from the middle; petals rose-purple, 7 to 12 lines long, cuneate-obovate, 3-lobed; 3 upper petals commonly approximate and ascending, the lower one opposite these and declined, thus making a corolla which is positionally irregular and as if 2-lipped; filaments not at all or scarcely dilated at base or apex, the anthers recurved after dehiscence and sparsely short-ciliate; capsule sessile, nearly straight, ¾ to 1 inch long; seeds short-subcylindric, pointed at one end, the other end oblique and margined with a dense row of short teeth.

Loose or shifting fine soil on slopes, in openly wooded or brushy country, 50 to 2500 feet: Coast Ranges from Humboldt and Glenn Cos. to Santa Clara Co. May-June.

Note on variation.—The petals in this species sometimes approach those of Clarkia breweri in shape, that is, the middle lobe is sometimes prolonged and spatulate. The filaments in such specimens are not dilated and the anthers are curled.

Locs.—Hupa, *Chandler* 1325; Buck Mt., Humboldt Co., *Tracy* 2742; Ukiah, *Bolander* 3935; Idol House, Mendocino Co., *Chandler* 1073; Alder Sprs., Glenn Co., *Heller* 11,457; betw. Bear Valley and Stanton Valley, w. Colusa Co., *Jepson* 8973; Salmon Creek, Gravelly Valley, n. Lake Co., *Jepson* 14,423; Kenwood, Sonoma Co., *Michener & Bioletti;* Howell Mt., Napa Co., *Jepson* 2438; Gates Cañon, Vaca Mts., *Jepson* 14,424; Bodega, *Vina Krager;* Fairfax, Marin Co., *Newlon* 8; Ross Valley, Marin Co., *Jepson;* Berkeley Hills, *Davy* 718; upper Marsh Creek, Mt. Diablo, *Jepson* 9987; Cedar Mt., Alameda Co., *Elmer* 4356; Saratoga, Santa Cruz Co., *Pendleton* 346.

Refs.—CLARKIA CONCINNA Greene, Pitt. 1:140 (1887); Jepson, Fl. W. Mid. Cal. 332 (1901), Man. 673, fig. 661 (1925). *Eucharidium concinnum* F. & M. Ind. Sem. Hort. Petrop. 2:11 (1835), type loc. Ft. Ross, Sonoma Co.; Lindl. Bot. Reg. t. 1962 (1837); Jepson, Fl. W. Mid. Cal. ed. 2, 278 (1911). *E. grandiflorum* F. & M. Ind. Sem. Hort. Petrop. 7:48 (1841), type loc. Ft. Ross, Sonoma Co. *C. grandiflora* Greene, Fl. Fr. 223 (1891).

5. **C. breweri** Greene. FAIRY FANS. Stems with few and spreading branches, 5 to 9 inches high; calyx-tube 1 to 1¼ inches long; petals luminous pink, fan-shaped and obcordate, about 1 inch long, the rather deep sinus with a linear or spatulate lobe proceeding from it which surpasses the large lateral lobes; filaments clavate- or globose-dilated at apex; anthers linear, brick-red, 3 lines long, conspicuously ciliate; style much longer than the stamens; stigmas white; capsule stout, sessile, straight, 1¼ inches long; seeds as in no. 4.

Loose shale slopes, 2000 to 3700 feet: Mayacamas, Mt. Hamilton and San Carlos ranges; east side of the Santa Cruz Mts. May-June.

Locs.—Geyser Mts., Sonoma Co.; Loma Prieta (Fl. W. Mid. Cal. ed. 1, 332); La Puerta Creek, w. Stanislaus Co., *Elmer* 4343; Mt. Day, Santa Clara Co., *R. J. Smith;* Devil Hole, *A. J. Soares;* Mt. Hamilton, *Holden;* Cerro Bonita Mine, Panoche, Fresno Co. (Bull. Torr. Club 56:196); San Benito River Cañon, San Carlos Range, *Jepson* 2706.

Refs.—CLARKIA BREWERI Greene, Pitt. 1:141 (1887); Jepson, Fl. W. Mid. Cal. 332 (1901), Man. 674 (1925). *Eucharidium breweri* Gray, Proc. Am. Acad. 6:532 (1865), type loc. Mt. Oso, Mt. Hamilton Range, *Brewer;* Jepson, Fl. W. Mid. Cal. ed. 2, 278 (1911). *C. saxeana* Greene, Pitt. 1:140 (1887), type loc. the Geysers, Sonoma Co., *A. W. Saxe.*

7. GODETIA Spach

Mostly erect annuals with narrow shortly petioled or sessile alternate leaves. Flowers showy, red, purple, cream-color or nearly white, opening during the day, disposed in leafy racemes or spikes, the inflorescence sometimes reduced to but few flowers or a single one. Calyx-tube obconic or funnelform, this and the calyx often colored. Calyx-lobes 4, reflexed in anthesis, or united and turned to one side. Petals 4, commonly broad and entire, sometimes notched or 2-lobed. Stamens 8, those opposite the petals shorter; anthers basifixed. Capsule linear, rarely ovate, 4-sided or terete, often longitudinally ribbed, 4-celled, 4-valved. Seeds in 1 or 2 rows.—Species about 25, western North and South America. (C. H. Godet, 1797–1879, author of Flore du Jura.)

Bibliog.—Watson, S., Revision of the extra-tropical N. Am. species of the genus Oenothera: [section] Godetia (Proc. Am. Acad. 8:596–600,—1873). Jepson, W. L., A synopsis of the N. Am.

Godetias (Univ. Cal. Publ. Bot. 2:319–354, pl. 29,—1907). Léveillé, H., Monographie du genre Onothera: groupe des Godetia 259–285 (1908). Nelson, Aven, and Macbride, J. F., [Godetia reduced to] Clarkia (Bot. Gaz. 65:59–65,—1918). Hitchcock, C. L., Revision of the N. Am. species of Godetia (Bot. Gaz. 89:321–361, fig. 1,—1930).

A. Buds erect.

Calyx-tube long (2½ to 5½ lines).
Calyx-lobes remaining united and turned to one side under the flower.
Stem commonly branching; flowers loosely spicate-paniculate; capsule teretish, usually bluntish, not ribbed, 1 to 1⅜ inches long; Coast Ranges..........1. *G. amoena.*
Stem usually simple or nearly so; flowers in a dense terminal spike; capsule short (¾ inch), 8-ribbed; Humboldt coast..........2. *G. whitneyi.*
Calyx-lobes commonly distinct and closely reflexed; capsule 8-ribbed or the ribs sometimes weak.
Plants erect; capsule straight or nearly so; Sierra Nevada..........3. *G. viminea.*
Plants often diffuse; capsule curving; Monterey and San Luis Obispo Cos..........4. *G. parviflora.*
Calyx-tube short (1 to 1½ lines); calyx-lobes commonly distinct and closely reflexed; capsule 4-sided and 8-ribbed, often strongly so, or sometimes the ribs obsolete.
Capsule long and rather slender (½ to 1 inch); spikes usually long and flowers scattered; petals 2½ to 6 lines long..........5. *G. quadrivulnera.*
Capsule short and thickish (commonly 4 to 7 lines); spikes short and dense; petals 7 to 12 lines long..........6. *G. purpurea.*

B. Buds nodding; calyx-lobes remaining united and turned to one side under the flower.

Petals not clawed.
Corolla crimson or pink, 5 to 15 lines long; capsule commonly terete or teretish, not ribbed or not conspicuously so.
Petals not lobed.
Ovary with minute scattered gland-tipped hairs, also slightly puberulent; capsule markedly beaked; n. Sierra Nevada..........7. *G. arcuata.*
Ovary not glandular.
Stigmas a little united below, so as to form a saucer-shaped base; calyx-tube with a ring of hairs at mouth; South Coast Ranges to coastal S. Cal...8. *G. bottae.*
Stigmas distinct, the lobes ½ to 1¼ lines long; s. Sierra Nevada; San Luis Obispo Co.; coastal S. Cal.
Calyx-tube with a ring of hairs at middle or below; capsule slender, linear (¼ to ½ line wide); petals with purple base..........9. *G. cylindrica.*
Calyx-tube with a ring of hairs at mouth; capsule oblong-linear, thicker (more than ½ line wide); petals uniformly lavender..........10. *G. dudleyana.*
Petals lobed..........11. *G. biloba.*
Corolla yellow, rarely pinkish, 2 to 3 lines long; capsule 4-sided with plane or somewhat sulcate faces..........12. *G. epilobioides.*
Petals shortly clawed, rose-pink; capsule similar to no. 12; San Diego Co..........13. *G. delicata.*

1. **G. amoena** G. Don. SUMMER'S DARLING. Stem erect, simple or more commonly branching, 1 to 3 feet high; leaf-blades linear to lanceolate, narrowed at base to a petiole or sessile, ½ to 2 inches long (or with smaller ones fascicled in the axils), the uppermost half-conduplicate and curved; buds erect, rarely drooping; calyx-lobes united and turned to one side in anthesis but usually distinct at base, less commonly wholly distinct, 6 to 11 lines long, their tips not free in the bud; petals lilac-crimson or red-pink, often with a darker central splotch and darker base, obovate, truncatish, abruptly narrowed to a short claw, 7 to 11 lines long; stigmas yellow, linear, 1½ to 3 lines long; ovary canescent; capsules teretish, not ribbed, tapering very slightly to each end, blunt at apex or rarely very shortly beaked, 1 to 1⅜ inches long, sessile or on pedicels to 3 lines long.

Dry hills, bushy or wooded slopes near the coast, 100 to 3500 feet: Coast Ranges from Monterey Co. to Del Norte and Siskiyou Cos. North to British Columbia. June-Aug.

Locs.—Gavilan Range, Monterey Co., *Brewer* 754; Gilroy (mts. w.), *Jepson* 14,358; Santa Cruz, *F. P. McLean;* Saratoga, Santa Clara Co., *Davy* 299; betw. Mission San Jose and Vallecitos, *Jepson* 14,359; Belmont, *Davy* 811; Berkeley, *Jepson* 10,027; Mt. Tamalpais, *Jepson* 14,356; York Creek, St. Helena, *Jepson* 2429; Butts Cañon, n. Napa Co., *Jepson* 14,360; betw.

Cloverdale and Geyserville, *M. S. Baker* 670; Indian Valley, ne. Lake Co., *Jepson* 9002a; Mill Creek Cañon, Ukiah, *Jepson* 2242; Garberville, s. Humboldt Co., *Jepson* 12,369; Hay Fork Valley, Trinity Co., *Tracy* 6465; betw. Three Creeks and Willow Creek, n. Humboldt Co., *Jepson* 2126; Martin ranch, South Fork Trinity River, *Jepson* 2020; Trinidad, *M. S. Baker* 172; Sisson, Siskiyou Co., *Jepson* 14,371; Cottage Grove, w. Siskiyou Co., *Jepson* 2863.

Var. **lindleyi** Jepson. Spotted Blush. Petals 10 to 17½ lines long, almost uniformly with a large central blotch.—Mostly along the coast, 100 to 2500 feet, from Sonoma Co. to Del Norte Co. North to Washington. June-July. In Sonoma Co. the spot on the petals is inside; towards the interior of Humboldt Co. we find it on the outside (Redwood House, *M. S. Baker* 68), but on the inside along the coast line (Capetown, *Jepson*). In other localities colonies show both spotted and unspotted petals. The capsules are thickened at the middle in Sonoma Co., but this character occasionally appears in northern plants also. Indeed, there is a fluctuating tendency for the capsule to thicken at the middle or above in all of our species.

Locs.—Windsor, Sonoma Co., *Jepson* 9296; Willits, *Jepson* 12,357; Ft. Bragg, *W. C. Mathews;* Bear River, Humboldt Co., *Jepson* 2141; Shelter Cove, Humboldt Co., *Tracy* 4998; Iaqua, Humboldt Co., *Tracy* 7739; betw. Three Creeks and Redwood Creek, Humboldt Co., *Jepson* 2130; Ragged Hill, Crescent City, *Jepson* 9406. Other similar large-flowered specimens without the characteristic petal blotch range southward to San Mateo Co.: Moss Beach, *Alice King;* betw. Salada and Mussel Rock, *Newlon* 251.

Var. **concolor** Jepson. Simple or with a few branches from the base, 8 to 12 (or 24) inches high; leaf-blades narrowly linear to lanceolate; buds sometimes nodding; petals uniform crimson, 5 to 7½ lines long; capsule slender, minutely canescent, tipped with a beak 1 to 2½ lines long.—Hillslopes and flats, 1900 to 5200 feet: North Coast Ranges from Napa Co. to Trinity Co.; Sierra Nevada from Eldorado Co. to Modoc Co. May-July. This variety is closely similar to G. arcuata Jepson in foliage, flowers and fruit and seems to differ only in pubescence of capsule.

Locs.—North Coast Ranges: Vaca Mts., w. Solano Co., *Jepson* 14,351; Weaverville, *H. S. Yates* 315; Shasta Valley, *Hall & Babcock* 4088. Sierra Nevada: Placerville, *K. Brandegee;* Fall River Sprs., ne. Shasta Co., *Hall & Babcock* 4174; Forestdale, sw. Modoc Co., *Nutting.*

Var. **albicaulis** Jepson. Stems white-shining, simple or strictly branched, 20 inches high; leaf-blades linear, acuminate; buds nodding; petals 1 to 1¼ inches long; capsules 1 to 1¾ inches long, with a beak usually 5 lines long.—Butte Co. plains and low foothills (Little Chico Creek, *R. M. Austin*). July.

Refs.—Godetia amoena G. Don; Sweet, Hort. Brit. ed. 3, 237 (1839); Jepson, Fl. W. Mid. Cal. 333 (1901), ed. 2, 279 (1911), Univ. Cal. Publ. Bot. 2:325 (1907), Man. 676, fig. 662 (1925). *Oenothera amoena* Lehm. Ind. Sem. Hort. Hamb. 8 (1821), type a garden plant, the seed from "America septentrionalis", cult. in Botanic Garden at Hamburg. *O. prismatica* var. *amoena* Lévl. Monog. Onoth. 266 (1908), in part. *Clarkia amoena* Nels. & Mcbr. Bot. Gaz. 65:62 (1918). *Oenothera rosea-alba* Bernhard, Ind. Sem. Hort. Erfurt. (1824); Reichz. Icon. Bot. Exot. 1:34, pl. 47 (1827), type loc. uncertain "habitat in regno Nepaul ? vel potius in America apud confines". *G. rubicunda* Lindl. Bot. Reg. t. 1856 (1836), type collected by *Douglas,* probably between Sonoma and Monterey. *Oenothera rubicunda* H. & A. Bot. Beech. 342 (1840). *G. vinosa* Lindl. Bot. Reg. t. 1880 (1836), type from Cal., *Douglas. G. viminea* Parsons, Wild Fls. Cal. 240 (1897); not G. viminea Spach (1835). *G. blasdalei* Jepson, Univ. Cal. Publ. Bot. 2:330 (1907), type loc. Pt. Isabel, *Blasdale;* Fl. W. Mid. Cal. ed. 2, 279 (1911); Man. 677 (1925). *G. amoena* var. *pygmaea* Jepson, Man. 677 (1925). *G. amoena* f. *pygmaea* Jepson, Univ. Cal. Publ. Bot. 2:328 (1907), type loc. Conn Valley, Napa Range, *Jepson* 14,373. *G. amoena* f. *huntiana* Jepson, Univ. Cal. Publ. Bot. 2:329 (1907), type loc. Blue Lakes, Lake Co., *Jepson & Hunt. G. amoena* var. *huntiana* Jepson, Man. 677 (1925). Var. lindleyi Jepson, Univ. Cal. Publ. Bot. 2:329 (1907), Man. 677 (1925). *Oenothera lindleyi* Dougl.; Hook. Bot. Mag. t. 2832 (1827), type from "Fort Vancouver. Multnomah river" (acc. Kew Herb.), *Douglas. G. lindleyana* Spach, Hist. Veg. Phan. 4:392 (1835). *Oenothera lindleyana* Steud. Nom. ed. 2, 2:207 (1841). *Clarkia amoena* f. *lindleyi* Nels. & Mcbr. Bot. Gaz. 65:62 (1918). *G. amoena* var. *sonomensis* Htck. Bot. Gaz. 89:338 (1930), type loc. Glen Ellen, Sonoma Co., *C. L. Hitchcock* 18. *G. grandiflora* Lindl. Bot. Reg. misc. 61 (1841), type loc. Columbia River, *Moreton Dyer. Oenothera grandiflora* Wats. Proc. Am. Acad. 8:596 (1873). Var. concolor Jepson, Fl. W. Mid. Cal. 334 (1901), type loc. Pope Valley grade e. of Calistoga, *Jepson* 13,337; Univ. Cal. Publ. Bot. 2:328 (1907); Man. 677 (1925). *Clarkia amoena* f. *concolor* Nels. & Mcbr. Bot. Gaz. 65:62 (1918). Var. albicaulis Jepson, Univ. Cal. Publ. Bot. 2:329 (1907), type loc. Rancho Chico, Butte Co., *Anna Bidwell* 122; Man. 677 (1925).

2. **G. whitneyi** T. Moore. Dwarfish, the stem stout, simple, or with short slender branches above the base, 8 to 12 inches high, very leafy; herbage minutely strigulose; leaf-blades oblong, tapering strongly to apex and to the short petiole at base, ¾ to 1½ inches long; flower-buds very large, 1¼ to 1¾ inches long, the calyx-tips not free; flowers in a short spike or dense cluster of short subterminal branchlets; petals cuneate-obovate, retuse at apex, 1½ to 1¾ inches long, rose-red with a deeper flush or blotch in center; stigmas yellow, linear, 3 lines long; capsules canescent, thick and short, ¾ inch long, sessile; seeds in 2 rows in each cell.

Hill slopes facing the ocean: southwestern Humboldt Co. July.

Historical note.—Godetia whitneyi, as based on *Bolander* 6534, appears to grow only at Shelter Cove on the Humboldt coast. We have seen no native specimens save those collected by Bolander in 1866, which are remarkable for their large flower buds, large petals, short capsules and condensed inflorescence. The little flat of eighty acres at Shelter Cove, the original station, has been, says Jos. P. Tracy, under close agricultural occupation for sixty years and the species may now be extinct. In any event it has not been found by field students elsewhere along the coast and probably only thrice at Shelter Cove. Its fusiform capsule would appear to be very peculiar. Possibly Godetia whitneyi, with its condensed inflorescence and large flowers, was derived as a mutant from G. amoena, just as G. purpurea may be regarded as a condensed state of G. quadrivulnera. Or it may be a fortuitous variation which is not yet well-established or dispersed, just as we occasionally find localized plants of G. quadrivulnera which develop extremely dense flowering and fruiting clusters, especially when the axis is more or less fasciated.

Refs.—GODETIA WHITNEYI T. Moore, Flor. & Pomol. 101 (1871). *Oenothera whitneyi* Gray, Proc. Am. Acad. 7:340, 400 (1868), type loc. Shelter Cove, Humboldt Co., *Bolander* 6534; Hooker, Bot. Mag. t. 5867 (1870). *O. auricula* var. *whitneyi* Lévl. Monog. Onoth. 270 (1908). *Clarkia whitneyi* Nels. & Mcbr. Bot. Gaz. 65:61 (1918). *G. grandiflora* Jepson, Man. 679 (1925), not Lindley (1841).

3. **G. viminea** Spach. Farewell-to-Spring. Stems whitish and shining or sometimes reddish above, strictly erect and simple or with simple suberect branches, 1 to 3 feet high; herbage finely pubescent, the older parts of the stem glabrescent; leaf-blades linear to lanceolate, entire, narrowed at base to a short petiole or the upper sessile and commonly conduplicate, ½ to 2 inches long; buds erect; calyx-tube broadly vase-shaped or narrowly campanulate, whitish-membranous, 3 to 5½ lines long; calyx-lobes lanceolate, acuminate, distinct, primly reflexed, their tips free in the bud; petals purplish or crimson, with a large purple splotch in center or at apex, and often yellow at base, cuneate-obovate, truncatish, 6 to 12 lines long; stamens about ½ the length of the petals or less; anthers white, longer than the filaments; style as long as or longer than the stamens; stigmas purple, hispidulose; capsules 4-sided with 2 ribs on each side, or those of the lateral faces obscure or wanting, puberulent or subglabrous, ½ to ¾ (or 1) inch long, sessile or rarely with a pedicel ½ line long; seed very short, weakly margined.

Dry hill slopes, 1300 to 4700 feet: Tehachapi Mts., Sierra Nevada foothills from Kern Co. to Eldorado Co. North to Oregon. May-July.

Locs.—Tehachapi Mts.: Tejon Cañon, Kern Co., *Coville & Funston* 1217. Sierra Nevada: Havilah, Kern Co., *Coville & Funston* 1071; Upper Grouse Valley, Tulare Co., *Jepson* 4711; North Fork Kaweah River, *Jepson* 572; betw. Clarks Valley and Squaw Valley, s. Fresno Co., *Jepson* 2747; Auberry, Fresno Co., *Jepson* 12,886; Big Mdws., betw. Coulterville and Yosemite, *Jepson* 14,364; Yosemite, *Docia Patchett;* Hetch-Hetchy, *Jepson* 3412; Columbia, Tuolumne Co., *Jepson* 6448; Jackson, *C. L. Hitchcock* 31; Eldorado, Calaveras Co., *Greene.*

Var. incerta Jepson. Very leafy, 7 to 15 inches high; petals deep crimson, 6 to 10 lines long; capsules abundant, 8-ribbed; stigmas oval.—Meadows, Yosemite Valley.

Refs.—GODETIA VIMINEA Spach, Hist. Veg. Phan. 4:389 (1835); Jepson, Univ. Cal. Publ. Bot. 2:336 (1907), Fl. W. Mid. Cal. ed. 2, 280 (1911), Man. 677 (1925). *Oenothera viminea* Dougl.; Hook. Bot. Mag. t. 2873 (1828), type from "interior of northern California", that is, Oregon, *Douglas. O. prismatica* var. *viminea* Lévl. Monog. Onoth. 265 (1908). *Clarkia viminea* Nels. & Mcbr. Bot. Gaz. 65:64 (1918), in part. *Oenothera williamsonii* D. & H. Pac. R. Rep. 5:7, pl. 5 (1855), type loc. Fort Miller, *Heermann. G. williamsonii* Wats.; B. & W. Bot. Cal. 1:230 (1876). *Oenothera auricula* var. *tenella* sub-var. *williamsonii* Lévl. Monog. Onoth. 271 (1908). *G. viminea* var. *congdonii* Jepson, Univ. Cal. Publ. Bot. 2:338 (1907), type loc. Hetch-Hetchy, *Congdon;* Man. 677 (1925); Htck. Bot. Gaz. 89:346 (1930). Var. INCERTA Jepson, Univ. Cal. Publ. Bot. 2:339 (1907), type loc. Yosemite Valley, *Jepson* 14,365; Man. 677 (1925).

4. **G. parviflora** Jepson. Rose Godetia. Stems usually diffusely branching from the base, ½ to 2¼ feet long, the branches numerous and wiry; leaf-blades narrowly lanceolate or linear, 5 to 12 lines long, the lowest oblong or oblong-ovate; calyx in bud 4-sided and its lobe-tips free, the segments in anthesis commonly distinct; calyx-tube pinkish, long and slender (2½ to 7½ lines long), usually longer than the ovary and commonly swollen slightly at the summit of ovary; petals cuneate-obovate, rose-red, 4 to 10 lines long; filaments of stamens usually subequal; style nearly or quite equaling the petals; stigmas purple, elliptic, somewhat united

at base; capsules teretish, rather strongly curved, obscurely 2-ribbed on the sides, 4½ to 10 lines long.

Dry valleys and hill slopes, 750 to 1000 feet: upper Salinas River watershed in Monterey and San Luis Obispo Cos., east of the Santa Lucia Mts. May-July.

Locs.—San Miguelito Rancho, *Jepson* 1624; Jolon, Monterey Co., *K. Brandegee;* Paso Robles, *Benj. Cobb* 15; Templeton, *Davy* 7595; Atascadero, *C. L. Hitchcock* 8; Santa Margarita, *K. Brandegee;* La Panza, San Juan River, *Summers.*

Var. **margaritae** Htck. Petals rose-red, with yellow base, 6 to 12 lines long; filaments unequal.—Dry slopes, 100 to 1000 feet: Santa Margarita Valley; San Luis Obispo Co. west of the Santa Lucia Mts.

Locs.—Santa Margarita Valley, *Rhoda Reed;* Cavitas Cañon, San Luis Obispo, *Rhoda Reed;* Price Cañon, se. of Edna, *C. L. Hitchcock* 36; betw. Arroyo Grande and Pismo, *Rhoda Reed.*

Var. **luteola** Htck. Petals 5 to 10 lines long, cream-color with large crimson central spot; filaments unequal.—Grassy hillsides, San Luis Obispo Co.: McGinnis, *Palmer* 143; betw. Atascadero and Morro, *C. L. Hitchcock* 40.

Refs.—GODETIA PARVIFLORA Jepson, Univ. Cal. Publ. Bot. 2:339 (1907), Fl. W. Mid. Cal. ed. 2, 280 (1911), Man. 677 (1925). *Oenothera viminea* var. *parviflora* H. & A. Bot. Beech. 342 (1840), type from Cal., *Douglas,* the exact locality not known (as generally in Douglas plants from Cal.), but doubtless Monterey Co. *O. tenella* Wats. Proc. Am. Acad. 8:598 (1873), in part; not O. tenella Cav. (1797). *G. quadrivulnera* var. *tenella* Jepson, Fl. W. Mid. Cal. 334 (1901), in part. Var. MARGARITAE Htck. Bot. Gaz. 89:350 (1930). *G. viminea* var. *margaritae* Jepson, Univ. Cal. Publ. Bot. 2:339 (1907), type loc. Santa Margarita Valley, San Luis Obispo Co., *Summers;* Man. 677 (1925). Var. LUTEOLA Htck. Bot. Gaz. 89:349 (1930), type loc. "top of grade between Atascadero and Morro Beach, San Luis Obispo Co.", *C. L. Hitchcock* 40.

5. **G. quadrivulnera** Spach. FOUR-SPOT. Stem erect, simple or with simple branches from below the middle, ⅔ to 1⅔ feet high; herbage pubescent or puberulent; blades of lowest leaves obovate or oblong, 5 to 11 lines long, the upper narrowly or broadly linear, the uppermost lanceolate and somewhat conduplicate, ⅝ to 1⅜ inches long; flowers discrete or remote; calyx-lobes usually distinct and reflexed (in the earliest flowers sometimes united and turned to one side); petals lilac or pale crimson, usually with a spot at the top, 2½ to 6 (or 7) lines long; ovary canescent to densely villous; stigmas purple, short-oblong; capsules sharply 4-sided, 8-ribbed or the ribs sometimes obscure, shortly beaked or sometimes bluntish, ½ to 1 inch long, sessile.

Dry hillsides, 20 to 4400 feet: coastal Southern California; Coast Ranges from San Luis Obispo Co. to Humboldt Co.; Sacramento Valley; Sierra Nevada from Tulare Co. to Plumas Co. North to Washington. May-July.

Note on variation.—Of Californian species of Godetia, Godetia quadrivulnera is the most widely distributed and the most variable. Variability in shape, size and color of the petals is a striking feature. In one colony a few yards square, where the individuals closely match each other and appear to be of one genetic constitution, a wide range of petal form may occur: petals truncate and erosulate, petals truncate with a notch, petals truncate and erosulate with a central spear point, petals broadly obovate, petals narrowly obovate, and petals extremely narrow with a spear point set in the cleft at apex, petals linear and 3-lobed at apex (Owens Creek, Mariposa Co., *Jepson* 12,760, 12,761). Pubescence is not only variable as from one locality to another, but the degree of it changes from the juvenile to the senile stages. Plants bearing flowers as large or nearly as large as those of Godetia purpurea occur and when the inflorescence is variously congested represent intergrades to that species, as represented by Godetia quadrivulnera var. elmeri Jepson.

Locs.—S. Cal.: Mesa Grande, San Diego Co., *E. Ferguson* 28; Ramona, San Diego Co., *K. Brandegee;* Lakeside, San Diego Co., *Hall* 7438; Fullers Mill, San Jacinto Mts., *Hall* 2262; Redlands, *Condit;* San Bernardino foothills, *Parish;* San Antonio Cañon, San Gabriel Mts., *Peirson* 467; Griffith Park, Los Angeles, *Braunton* 401; Santa Barbara, *M. S. Baker.* Coast Ranges: Arroyo Grande, *Summers;* Lopez Cañon, San Luis Obispo, *Rhoda Reed;* Waltham Creek, San Carlos Range, *Jepson* 2663; Santa Margarita, *Rhoda Reed;* Paso Robles, *Barber;* San Miguelito Rancho, Santa Lucia Mts., *Jepson* 1626; Ventana Cone, Monterey Co., *Davy* 7394; Seaside, Monterey Co., *Heller* 6754; Gilroy (hills w.), *Jepson* 14,338; Eva sta., Santa Cruz Mts., *Jepson* 14,340; Belmont, San Mateo Co., *Davy* 792; Alameda, *Bolander;* Mt. Tamalpais, *Jepson* 14,348; Hoods Peak, Sonoma Co., *Bioletti;* St. Helena, *Jepson* 14,344; Houghs Sprs., ne. Lake Co., *Jepson* 9016; Bennett Spr., Glenn Co., *Heller* 11,540; Round Valley, Mendocino Co., *P. E. Goddard* 606; Cummings, n. Mendocino Co., *Jepson* 1873; Rush Creek, Trinity Co., *H. S. Yates* 405; Kneeland Prairie, Humboldt Co., *Tracy* 3831; betw. Orleans Bar and Sommes Bar, Klamath

River, *Chandler* 1471a; Klamath Hills near Yreka, *Butler* 1375. Sacramento Valley: Main Prairie, Solano Co., *Jepson* 14,342; College City, Colusa Co., *Alice King;* Willows, Glenn Co., *Jepson* 14,345. Sierra Nevada: Three Rivers, Tulare Co., *K. Brandegee;* Owens Creek, Mariposa Co., *Jepson* 12,761; Murphys Camp, Calaveras Co., *Davy* 1533; Drytown, Amador Co., *Hansen;* New York Ravine, Eldorado Co., *K. Brandegee;* Crescent Mills, Plumas Co., *Heller & Kennedy* 8827; betw. Payne Creek and Mineral, Tehama Co., *J. Grinnell;* Stillwater Creek, Shasta Co., *Blankinship.*

Var. **vacensis** Jepson. Stems slender, often branched at the base, the tips somewhat whip-like; flowers very remote; capsules slender, 1¼ inches long.—Vaca Mts., Solano Co.

Var. **davyi** Jepson. Leaf-blades all or mainly oblong and mostly obtuse, 4 to 6 (or 9) lines long; midrib of valves of capsule prominent, accessory ribs none.—Along the coast line, San Luis Obispo Co. to Del Norte Co.

Locs.—Morro, San Luis Obispo Co., *Condit;* Ocean View, San Francisco, *Heller* 8382; Pt. Reyes, *Davy* 6701; Humboldt Bay, *Tracy* 2592; Lake Earl, Del Norte Co., *Parks* 8276.

Var. **rubrissima** Jepson. Petals roundish-ovate, 4½ to 6½ lines long, uniformly deep reddish-purple; ovaries canescent; capsules strigulose-pubescent.—Coastal S. Cal.: Box Springs Mt., Riverside; Escondido, San Diego Co., *Carl Meyer* 108.

Var. **lanata** Jepson comb. n. Inflorescence often congested; ovary densely lanate; capsule more or less lanate or hairy, 8 to 13 lines long.—Monterey Co.: Bardin switch, *K. Brandegee;* Lucia, *K. Brandegee.*

Var. **elmeri** Jepson comb. n. Flowers loosely spicate below the dense terminal cluster of buds; petals broadly ovate, dark red, 7 lines long; capsule stout, rather short.—Coast Ranges (Dinsmore ranch, Buck Mt., Humboldt Co., *Tracy* 4244; Halls Valley, Mt. Hamilton Range, *Pendleton* 832); Santa Barbara Co. (Santa Rita, *Condit*).

Var. **capitata** Jepson comb. n. Stem about 20 inches high, with simple secondary branches from the base, 2¼ to 6 inches long; herbage puberulent; flowers in head-like bracteate clusters at end of branches; ovaries densely pilose.—Southern Fresno Co., near the Sierra Nevada foothills.

Refs.—GODETIA QUADRIVULNERA Spach, Hist. Veg. Phan. 4:389 (1835); Jepson, Fl. W. Mid. Cal. 334 (1901), ed. 2, 280 (1911), Univ. Cal. Publ. Bot. 2:340 (1907), Man. 678 (1925). *Oenothera quadrivulnera* Dougl.; Lindl. Bot. Reg. t. 1119 (1827), type from "northwest of North America", *Douglas. O. prismatica* var. *quadrivulnera* Lévl. Monog. Onoth. 267 (1908). *Clarkia quadrivulnera* Nels. & Mcbr. Bot. Gaz. 65:63 (1918). *Oenothera viminea* var. *intermedia* Kell. Proc. Cal. Acad. 1:61 (1855), type loc. Alameda, *Nevins. O. quadrivulnera* var. *hirsuta* Kell. Proc. Cal. Acad. 5:45 (1873), type loc. Petaluma, *Harford. G. micropetala* Greene, Pitt. 1:32 (1887), type loc. Walnut Creek, Contra Costa Co., *Greene. G. purpurea* var. *procera* Jepson, Univ. Cal. Publ. Bot. 2:346 (1907), type loc. Berkeley, *Bioletti. G. quadrivulnera* f. *setchelliana* Jepson, Univ. Cal. Publ. Bot. 2:341 (1907), type loc. Soquel Cañon, Santa Cruz Mts., *Jepson* 13,335; var. *setchelliana* Jepson, Man. 678 (1925). *G. quadrivulnera* var. *hallii* Jepson, Univ. Cal. Publ. Bot. 2:341 (1907), type loc. Box Springs Mt., Riverside, *Hall* 6241; Man. 678 (1925). *G. quadrivulnera* var. *apiculata* Jepson, Univ. Cal. Publ. Bot. 2:341 (1907), type loc. Howell Mt., *Jepson* 2441; Man. 678 (1925), buds slender-apiculate. *G. goddardii* Jepson, Univ. Cal. Publ. Bot. 2:342 (1907), type loc. Hupa wagon trail near Redwood Creek, Humboldt Co., *Jepson* 1971; Fl. W. Mid. Cal. ed. 2, 280 (1911); Man. 678 (1925). *G. albescens* var. *micropetala* Jepson, Fl. W. Mid. Cal. 334 (1901). *G. goddardii* var. *miguelita* Jepson, Univ. Cal. Publ. Bot. 2:342 (1907), type loc. San Miguelito Rancho, Monterey Co., *Jepson* 1625; Man. 678 (1925). Var. VACENSIS Jepson, Univ. Cal. Publ. Bot. 2:341 (1907), type loc. Vaca Mts., *Jepson;* Man. 678 (1925); Htck. Bot. Gaz. 329 (1930). *G. quadrivulnera* f. *flagellata* Jepson, Univ. Cal. Publ. Bot. 2:341 (1907), type loc. Vaca Mts., *Jepson* 13,340; var. *flagellata* Jepson, Man. 678 (1925). Var. DAVYI Jepson, Univ. Cal. Publ. Bot. 2:341 (1907), type loc. Pt. Reyes, *Davy* 6701; Man. 678 (1925). Var. RUBRISSIMA Jepson, Univ. Cal. Publ. Bot. 2:342 (1907), type loc. Box Springs Mts., Riverside, *Hall* 6240; Man. 678 (1925). Var. LANATA Jepson. *G. lanata* Elmer, Bot. Gaz. 41:318 (1906), type loc. Bardin switch, Monterey Co., *Elmer* 4376. Var. ELMERI Jepson. *G. purpurea* var. *elmeri* Jepson, Univ. Cal. Publ. Bot. 2:345 (1907), type loc. Santa Barbara, *Elmer* 3792; Man. 679 (1925). *G. purpurea* var. *parviflora* Htck. Bot. Gaz. 89:335 (1930), at least as to California plants. Var. CAPITATA Jepson. *G. goddardii* f. *capitata* Jepson, Univ. Cal. Publ. Bot. 2:342 (1907), type loc. Centerville, Fresno Co., *Jepson* 2745; var. *capitata* Armstrong & Thornber, Field Book Western Wild Fls. 318 (1915).

6. **G. purpurea** G. Don. VALLEY GODETIA. Stems prevailingly simple and usually stoutish, ⅓ to 2 feet high, the flowers capitately congested at the summit or disposed in the upper axils of the leafy stem, the single flowers sometimes replaced by a cluster of 2 to 4 and borne on very short branchlets; herbage minutely pubescent; leaf-blades ovatish-oblong or oblong, obtusish or merely acute, the upper oblong-lanceolate or lanceolate, entire or remotely denticulate, sessile or very shortly petioled, ½ to 1⅜ inches long; buds commonly pilose, their calyx-tips

but slightly free; calyx-tube 2½ to 3½ lines long, the lobes reflexed, distinct; petals broadly cuneate, truncatish and eroded at apex, 7 to 12 lines long, light crimson, usually with a wedge-shaped darker spot in middle at apex; stigmas oval, purple; ovary shaggy-villous or canescent; capsules 4-sided, sessile, stoutish and mostly short, 4 to 7 (or 11) lines long, shaggy or merely pubescent, 8-ribbed; seeds faintly granulate on sides.

Plains or valley flats, often on margins of former pools, 50 to 1500 feet: Sierra Nevada foothills from Butte Co. to Mariposa Co.; Great Valley; Coast Ranges from Mendocino Co. to Santa Cruz Co.; south to Santa Barbara Co. Mar.-May.

Geog. note.—Godetia purpurea is closely related to G. quadrivulnera. The two seem to be connected by many different phases or intergrades. The natural type of G. purpurea, the extreme phase furthest removed from G. quadrivulnera and therefore best marked, is the plant of the Sacramento Valley plains which grows in "hog-wallows" or on the clay edges of former winter pools or ponds. It is low, simple-stemmed or nearly so, the few flowers congested at apex, with the capsules markedly short (4 to 6 lines long) and strongly ridged, sometimes almost as if narrowly winged. In the Coast Range phases of it, the flowers are frequently smaller and the capsules often tend to elongate and be more hairy. Plants with looser inflorescence, smaller flowers and longer capsules represent intergrades to G. quadrivulnera.

The contrasts between Godetia purpurea and G. viminea may well be emphasized. The stems in G. purpurea are usually simple and they are also very leafy with broadish leaves. The short or condensed terminal inflorescence is very leafy, the leaves usually broader and longer than the cauline leaves and often nearly concealing the flowers. The stems in Godetia viminea and in its variety williamsonii are tall and branching and only moderately leafy. The leaves are narrower than in G. purpurea and the inflorescence is looser, much less leafy and with the leaves reduced. The calyx-tube in G. viminea is longer than in G. purpurea and is nearly always whitish. In addition to the differences in morphological characters, the geographic areas of distribution in these two species are mutually exclusive. Godetia purpurea is a plant of the Coast Range valley floors or of the Great Valley plains at low altitudes, about 1 to 1500 feet. On the other hand G. viminea, with its varieties, inhabits the Sierra Nevada at middle altitudes and is also found in its foothills but does not occur on the plains or valley floors to the west. The following are cited as G. purpurea.

Locs.—Sierra Nevada foothills: Clear Creek, Butte Co., *H. E. Brown* 212; Ruth Pierce Mine, Mariposa Co., *Jepson* 10,713. Great Valley: Willows, Glenn Co., *Jepson* 14,370; College City, Colusa Co., *Alice King;* Lincoln, Placer Co., *Hall* 10,291; Browns Valley, nw. Solano Co., *Jepson* 14,369; Elmira, Solano Co., *K. Brandegee;* Oakdale, Stanislaus Co., *Jepson* 14,368; Sanger, Fresno Co., *Condit.* Coast Ranges: Potter Valley, Mendocino Co., *Purpus;* Cache Creek Cañon, Yolo Co., *C. F. Baker* 5065; Sebastopol, *E. Ferguson* 226; Tiburon, *H. A. Walker* 1736; Oakland Hills, *Bolander;* Pescadero, Santa Cruz Co., *Guirado* 690. Santa Barbara Co.: Santa Maria, *Eastwood.*

Var. **arnottii** Jepson comb. n. Herbage glabrous; capsules short (4 to 5 lines), glabrous.—Margins of winter pools on the sandy-clay plains and valley floors, 1 to 500 feet: Solano Co. (Little Oak, Vacaville, *Jepson* 14,334; Elmira, *C. F. Baker*). Also collected by *Douglas*, doubtless in the South Coast Range valleys, his specimen at Kew labeled by William Hooker as Oenothera arnottii T. & G. All the specimens just cited represent Oenothera arnottii T. & G. Fl. 1:503 as to the diagnosis, but are different from the Douglas plant preserved in the Gray Herbarium, which is G. purpurea G. Don.

Refs.—GODETIA PURPUREA G. Don; Sweet. Hort. Brit. ed. 3, 237 (1839); Jepson, Univ. Cal. Publ. Bot. 2:344 (1907), Fl. W. Mid. Cal. ed. 2, 280 (1911), Man. 679 (1925). *Oenothera purpurea* Curt. Bot. Mag. t. 352 (1796), type collected by *Menzies*, on the "western coast of North America", probably between San Francisco and Monterey (typ. vidi). *Clarkia purpurea* Nels. & Mcbr. Bot. Gaz. 65:64 (1918), in part. *G. lepida* Lindl. Bot. Reg. t. 1849 (1836), type from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. 335 (1901). *G. purpurea* var. *lacunarum* Jepson, Univ. Cal. Publ. Bot. 2:346 (1907), type loc. Oakdale, Stanislaus Co., *Jepson* 14,374; Man. 679 (1925), stem strictly branched. *G. sparsifolia* Jepson, Univ. Cal. Publ. Bot. 2:347 (1907), type loc. Tracy, *B. Cobb;* Fl. W. Mid. Cal. ed. 2, 281 (1911); Man. 679 (1925). Var. ARNOTTII Jepson. *Oenothera arnottii* T. & G. Fl. 1:503 (1840), type from Cal., *Douglas. O. viminea* var. ("erecta glabriuscula glaucescens") H. & A. Bot. Beech. 342 (1840), California, *Douglas. G. arnottii* Jepson, Univ. Cal. Publ. Bot. 2:346 (1907), Fl. W. Mid. Cal. ed. 2, 281 (1911), Man. 679 (1925).

7. **G. arcuata** Jepson. KELLOGG GODETIA. Stem slender, sparingly branched, more or less falsely dichotomous on account of the repeated divergence of axis and branch, 7 to 20 inches high; leaf-blades linear, entire, obtusish, 1¼ to 2 inches long, the fascicled and upper leaves narrow (½ to 1 line broad), commonly conduplicate and appearing much narrower, more or less arcuate-curving, with long

slender acute tips, 2 to 2½ inches long; flowers few in the upper axils, the buds large, nodding, ovate, acute; calyx-tube 2 to 3 lines long, often purple inside, the lobes remaining united and turned to one side; petals fanshaped, lilac, 10 to 15 lines long, usually retuse at the more or less truncate apex; style much longer, often twice longer than stamens; anthers yellow; ovary sparingly puberulent and also with a few short gland-tipped hairs; stigmas linear; capsules 8-ribbed (the ribs separated by broad sharply defined channels, those opposite the partitions broader), about 12 lines long, with a beak 2½ to 3 lines long, the pedicels 2½ to 5 lines long; seeds sharply pointed at one end, the other end obliquely flattened and with a thin margin.

Hill slopes, 1000 to 2000 feet: Sierra Nevada foothills from Eldorado Co. to Mariposa Co. May-June.

Locs.—American River, Eldorado Co., comm. *Alice King;* Placerville, *K. Brandegee* ("this is Oenothera arcuata Kellogg", K. Brandegee); Sweetwater Creek, Eldorado Co., *K. Brandegee;* Pine Grove, Amador Co., *Hansen* 1157; Harmon Peak, Calaveras Co., *Davy* 1407; Chinese Camp, Tuolumne Co., *Jepson* 6327; Benton Mills, Mariposa Co., *Congdon.*

Refs.—GODETIA ARCUATA Jepson, Univ. Cal. Publ. Bot. 2:335 (1907), Man. 675 (1925). *Oenothera arcuata* Kell. Proc. Cal. Acad. 1:58 (1855), type loc. Placerville, *Garvett. Clarkia arcuata* Nels. & Mcbr. Bot. Gaz. 65:62 (1918). *Oenothera hispidula* Wats. Proc. Am. Acad. 8:599 (1873), type collected by Fremont in the "Sacramento Valley." *G. hispidula* Wats.; B. & W. Bot. Cal. 1:231 (1876). *Oenothera pulcherrima* Lévl. Monog. Onoth. 261 (1908), in part; not G. pulcherrima Greene (1891). *G. hansenii* Jepson, Univ. Cal. Publ. Bot. 2:336 (1907), type loc. Armstrong sta., Amador Co., *Hansen* 1090; Man. 676 (1925).

8. **G. bottae** Spach. Hill Godetia. Stem slender, erect, simple or more commonly branching at or from the base, 1 to 3¼ feet high; leaf-blades linear or lanceolate, or the lower oblong, remotely denticulate, ¾ to 2½ inches long, petioled or sessile; flowers axillary but falsely terminal through usurpation, the growing capsules thrusting the shoot to one side so that the latter seems proliferous; pedicels ¼ to 2 lines or none; flower buds nodding, slender-ovate, abruptly tipped with a slender short point; calyx-tube very short, 1 to 1½ lines long; calyx-lobes turned to one side, united in anthesis, commonly crimson-tinted; petals pink or light crimson, obovate, truncatish, 8 to 13 lines long; stamens equaling the style; stigma deeply parted into 4 oblong or elliptic lobes but united at base so as to form a swollen somewhat cup-shaped apex to the style; capsules scattered, rather distinctly 4-sided with the plane sides not at all ribbed or obscurely so, ¾ line broad, 11 to 16 lines long, on pedicels ½ to 1½ inches long; seeds all over minutely granulate.

Grassy hill and chaparral slopes, 50 to 1000 feet: South Coast Ranges in Monterey, San Benito, San Luis Obispo, and Santa Barbara Cos. May-June.

Locs.—Pajaro Hills, Monterey Co., *Chandler* 450; San Juan grade, San Benito Co., *C. L. Hitchcock* 35; Del Rey Cañon, Monterey Co., *E. Ferguson* 257; Sans Mill, Santa Lucia Mts., *Jepson* 1685; Paso Robles, *Barber;* Estrella, *Jared;* Arroyo Grande, *Alice King;* Santa Barbara, *A. L. Grant* 1697.

Var. **deflexa** Htck. Ovary straight and deflexed before anthesis; flowers usually in a closer spike than in the species.—Along the coast, Santa Barbara Co. to Orange Co.: Santa Inez Mts. (Gaviota, *Elmer* 3848); San Gabriel Mts. (Monrovia Cañon, *Peirson* 432); Santa Ana Mts. (Santa Ana Cañon, Orange Co., *C. L. Hitchcock* 99).

Refs.—GODETIA BOTTAE Spach, Nouv. Ann. Mus. Hist. Nat. ser. 3, 4:393 (1835), type loc. Monterey, *Botta;* Jepson, Univ. Cal. Publ. Bot. 2:330 (1907), Fl. W. Mid. Cal. ed. 2, 279 (1911), Man. 676 (1925). *Oenothera bottae* T. & G. Fl. 1:505 (1840). *O. godetia* Steud. Nom. ed. 2, 2:206 (1841). *G. bottae* var. *usitata* Jepson, Univ. Cal. Publ. Bot. 2:332 (1907), type loc. San Bernardino, *Parish* 3672 (ring of hairs at summit of calyx-tube). Var. DEFLEXA Htck. Bot. Gaz. 89:355 (1930). *G. deflexa* Jepson, Univ. Cal. Publ. Bot. 2:332 (1907), type loc. "sandy plains of Los Angeles", *W. Lobb;* Man. 676 (1925). *G. pulcherrima* Greene, Pitt. 2:217 (1891), type loc. Los Angeles Co., *W. F. Wheeler.*

9. **G. cylindrica** Htck. Band Godetia. Stem simple or at least rather strict, 7 to 20 inches high, few-flowered; leaf-blades narrowly linear or subfiliform, ¼ to ½ line wide; calyx indigo-purple; calyx-tube with a ring of white hairs at middle; petals obovate, truncatish, lilac-purple, or paler with a sprinkling of dark

dots, at base with a dark purple band, 9 to 11 lines long; anthers sometimes purple-dotted; capsules slender, ¼ to ½ line wide, teretish, not ribbed or obscurely ribbed, ¾ to 1½ inches long, sessile (or sometimes with a pedicel 3½ lines long).

Dry open or openly wooded slopes, 1000 to 5200 feet: Sierra Nevada foothills from Madera Co. to Kern Co.; San Luis Obispo Co. south to the San Emigdio Mts.; south to Los Angeles Co. Apr.-June.

Tax. note.—The ring of hairs set at the middle of the calyx (hypanthium)-tube is, says C. L. Hitchcock, a mark of Godetia cylindrica, as also of G. arcuata, whereas in G. bottae and G. dudleyana the ring is found at the mouth of the calyx (hypanthium)-tube (Bot. Gaz. 89:357).

Locs.—Sierra Nevada foothills: North Fork, Madera Co., *Jepson* 12,873; Trimmer Sprs., Fresno Co., *H. P. Kelley;* Kaweah River, *Hopping* 29; Bakersfield, *Davy* 1713; Blue Mt., Greenhorn Range, *Hall & Babcock* 5007; Caliente, Kern Co., *Coville & Funston* 1099. South Coast Ranges: betw. King City and Jolon, Monterey Co., *K. Brandegee;* Santa Margarita, *Summers;* Cuesta grade, San Luis Obispo, *Rhoda Reed* 462; betw. Pine Creek bridge and Cuyama Valley, *Jepson* 12,152; San Emigdio Cañon, *Davy* 1992; Old Fort Tejon, *Hall* 6279. S. Cal.: Lebec, n. Los Angeles Co., *C. L. Hitchcock* 44; Elizabeth Lake, Los Angeles Co., *C. L. Hitchcock* 55; Hopper Creek Cañon, Piru, Ventura Co., *C. L. Hitchcock* 43; San Marcos Pass, Santa Inez Mts., *Jepson* 12,147; Newhall, *C. L. Hitchcock* 1; Ojai Valley, *Olive Thacher.*

Var. **tracyi** Jepson var. n. Petals turning blue-purple in drying, ½ to 1¼ inches long; capsules thickened upward, 1 to 1¼ lines wide.—(Petala unc. ½–1¼ longa, caerulescentia; capsulae ad apicem latior, lin. 1–1¼ latae.)—North Coast Ranges in Mendocino Co. (Hopland, *Tracy* 9904), Humboldt Co. (Buck Mt., *Tracy* 9597) and Trinity Co. (Hayfork Valley, *Tracy* 6474; Three Forks of Mad River, *Tracy* 10,227), Colusa Co. (Stonyford, *Jepson* 16,297) and sw. Tehama Co. (Paskenta, *Jepson* 16,324, type).

Refs.—Godetia cylindrica Htck. Bot. Gaz. 89:352 (1930). *G. bottae* var. *cylindrica* Jepson, Univ. Cal. Publ. Bot. 2:332 (1907), type loc. Waltham Creek near Alcalde, sw. Fresno Co., *Jepson* 2656a; Man. 676 (1925). Var. tracyi Jepson.

10. **G. dudleyana** Abrams. Maiden Godetia. Stem slender, simple or with rather strict branches above the middle, less commonly from the base, ¾ to 2¾ feet high; herbage puberulent or the older parts glabrous; leaf-blades filiform to oblong, entire or remotely denticulate, ½ to 2½ inches long, petioled or sessile; conduplicate upper leaves few or none; flower buds slender, ovate, often abruptly attenuate near apex, nodding, the tips of the calyx-lobes not free; calyx purple to lavender, its lobes turned to one side in anthesis; petals cuneate-obovate, truncatish, pink-crimson with crimson dots in center, 6 to 13 lines long; stamens ⅔ to as long as the style; filaments all or only those of the short stamens purple; anthers yellow or purple; style purplish; capsules slender, often enlarged a little upward, long-beaked, sessile or nearly so, 2-ribbed on each face, 6 to 10½ lines long.

Barren hills or open chaparral, 1500 to 6000 feet: Sierra Nevada foothills from Tuolumne Co. to Kern and Inyo Cos.; Santa Inez Mts. to the San Jacinto Mts. May-July.

Locs.—Sierra Nevada: Italian Bar, South Fork Stanislaus River, *Jepson* 6383; Yosemite, *Jepson* 14,336; Greeley Hill, Coulterville, *Jepson* 14,337; Chowchilla School, Mariposa Co., *Jepson* 12,803; Wawona, Mariposa Co., *Jepson* 8387; North Fork, Madera Co., *Jepson* 12,870; Huntington Lake, *A. L. Grant* 1398; Sequoia Lake near Millwood, *H. P. Kelley;* Cedar Creek, North Fork Kaweah River, *Jepson* 614; Middle Tule River, *Jepson* 4864; Kern River Cañon, Kern Co., *Abrams* 11,989; Hunter ranch (s. of), Owens Valley, Inyo Co., *S. W. Austin* 387. S. Cal.: Wilson trail, Little Santa Anita Cañon, San Gabriel Mts., *Abrams* 2625; Cow Cañon divide, San Gabriel Mts., *Peirson* 466; City Creek Cañon, San Bernardino Mts., *Munz* 11,317; San Jacinto Mts., *Hall* 2265.

Refs.—Godetia dudleyana Abrams, Fl. Los Ang. 267 (1904), type loc. Little Santa Anita Cañon, San Gabriel Mts., *Abrams* 2625; Jepson, Univ. Cal. Publ. Bot. 2:333 (1907), Man. 675 (1925); Htck. Bot. Gaz. 89:355 (1930). *Clarkia dudleyana* Mcbr. Contrib. Gray Herb. 56:54 (1918). *G. jucunda* Jepson, Univ. Cal. Publ. Bot. 2:234 (1907), type loc. Greely Hill, Coulterville, Mariposa Co., *Jepson* 14,337.

11. **G. biloba** Wats. Mule-ear Godetia. Stem simple or branching, 1 to 2 feet high; leaf-blades oblong-lanceolate or linear, ½ to 2 inches long, entire or remotely denticulate, the lower on long slender petioles; flower buds nodding, narrowly ovate, commonly abruptly tipped with a slender point; calyx-lobes united

and turned to one side in anthesis, purplish-brown, the tips not free in the bud; calyx-tube with a dense ring of short white hairs at the mouth; petals broadly cuneate, emarginate or with a deep v-shaped notch at apex, 5 to 11 lines long; capsules 4-sided, weakly 8-ribbed, 5 to 7 (11) lines long, on pedicels ½ to 1 line long.

Openly wooded hill slopes, 25 to 2300 feet: Sierra Nevada foothills from Butte Co. to Mariposa Co.; Contra Costa Co. May-Aug.

Locs.—Sierra Nevada: Butte Co., *Hartweg;* Coloma, Eldorado Co., *Palmer* 2388; Jackson, *E. Mulliken* 108; Black Creek, Calaveras Co., *Tracy* 5638; Angels Camp, *Davy* 1484b; Columbia, *Jepson* 6441; Priest Hill, Tuolumne Co., *Jepson* 8339; Greeley Hill, Coulterville, *H. M. Evans;* Mt. Bullion, Mariposa Co., *Bolander* 6364. Coast Ranges: Donner Cañon, Mt. Diablo, *Jepson* 7585; Crockett, *Tidestrom.*

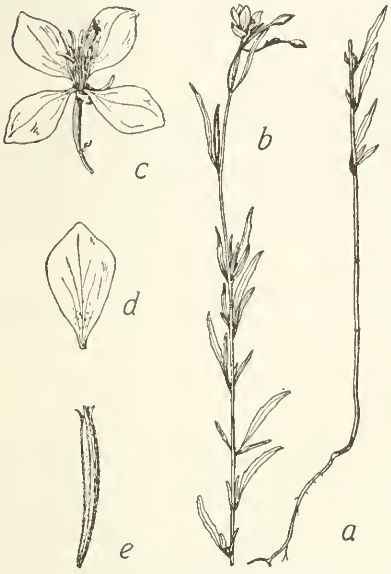


Fig. 255. GODETIA EPILOBIOIDES Wats. var. MODESTA Jepson. *a*, base of plant, × ½; *b*, upper part of plant, × ½; *c*, fl., × 1; *d*, petal, × 1½; *e*, capsule, × 1.

Var. **brandegeae** Jepson comb. n. Petals broad (mostly 5 to 10 lines), shallowly notched.—Sierra Nevada foothills from Eldorado Co. to Nevada Co. (Bear River, *Hall* 10,155).

Refs.—GODETIA BILOBA Wats.; B. & W. Bot. Cal. 1:231 (1876); Jepson, Fl. W. Mid. Cal. 333 (1901), ed. 2, 279 (1911); Univ. Cal. Publ. Bot. 2:333 (1907), Man. 675 (1925). *Oenothera biloba* Dur. Jour. Acad. Phila. ser. 2, 3:87 (1855), type loc. Nevada City, *Pratten. Oenothera prismatica* var. *biloba* Lévl. Monog. Onoth. 264 (1908). *Clarkia biloba* Nels. & Mcbr. Bot. Gaz. 65:60 (1918). Var. BRANDEGEAE Jepson. *G. dudleyana* f. *brandegeae* Jepson, Univ. Cal. Publ. Bot. 2:334 (1907), type loc. Sweetwater Creek, Eldorado Co., *K. Brandegee,* May 29, 1907. *G. dudleyana* var. *brandegeae* Jepson, Man. 675 (1925).

12. **G. epilobioides** Wats. CAÑON GODETIA. Stem slender, simple or nearly so, erect, 6 to 19 inches high; herbage minutely puberulent; leaf-blades oblong to linear, thin, remotely and minutely toothed, 5 to 11 lines long; petioles 1 to 3 lines long, the uppermost leaves nearly sessile; flowers scattered; buds nodding, the tips of the calyx-lobes not free; calyx-tube ¼ (or ½) line long; calyx-lobes united and turned to one side in anthesis; petals obovate, often very narrow, commonly cream-yellow, rarely lavender-pink and dotted on the lower half, 3 to 4½ lines long; stamens about half the length of the petals; anthers slightly shorter than filaments; stigmas very slightly lobed, as if capitate; capsules slender, 4-sided, with plane or flattish faces, or with the reddish or brown midnerve somewhat depressed, 10 to 12½ lines long; pedicels 1 to 2½ lines long, sometimes very short but always present.

Shaded cañon slopes and in valleys, 300 to 2000 feet: Sierra Nevada foothills from Stanislaus Co. to Fresno Co.; Colusa Co.; South Coast Ranges; coastal Southern California. South to Lower California. Apr.-May.

Locs.—Sierra Nevada foothills: Stanislaus Co. (foothills), (Bot. Gaz. 89:358); Auberry, Fresno Co., *Jepson* 12,893. Colusa Co. (Bot. Gaz. 89:358). South Coast Ranges: Antioch; San Luis Mt., *Rhoda Reed* 470. S. Cal.: Casmalia, Santa Barbara Co., *K. Brandegee;* Pelican Bay, Santa Cruz Isl., *Abrams & Wiggins* 9; Monrovia Cañon, San Gabriel Mts., *Peirson* 433; East Fork Santa Anita Cañon, San Gabriel Mts., *J. T. Howell* 3777; San Bernardino foothills, *Parish;* Banning, *M. F. Gilman* 23; San Jacinto River, *Jepson* 1265; Menifee, *Alice King;* Moro Hills near Fallbrook, *Abrams* 3331; San Diego, *K. Brandegee.*

Var. **modesta** Jepson comb. n. (Fig. 255.) Calyx-tube 1 line long; petals pink, oblong, acute, narrowed at base to a short but slender and distinct claw.—San Carlos Range.

Refs.—GODETIA EPILOBIOIDES Wats.; B. & W. Bot. Cal. 1:231 (1876); Jepson, Fl. W. Mid. Cal. 333 (1901), Univ. Cal. Publ. Bot. 2:343 (1907), Man. 678 (1925); Htck. Bot. Gaz. 89:357 (1930). *Oenothera epilobioides* Nutt.; T. & G. Fl. 1:511 (1840), type loc. San Diego, *Nuttall.*

Sphaerostigma epilobioides Walp. Rep. 2:78 (1843). *Clarkia epilobioides* Nels. & Mcbr. Bot. Gaz. 65:60 (1918). Var. MODESTA Jepson. *Clarkia modesta* Jepson, Man. 673 (1925), type loc. Waltham Creek, San Carlos Range, *Jepson* 2690.

13. **G. delicata** Abrams. CAMPO GODETIA. Stems erect, simple or branching, 1 to 2 feet high; herbage thinly puberulent or subglabrous; leaf-blades lanceolate to oblong, remotely or obscurely denticulate, ½ to 2 inches long, narrowed to petioles 1 to 5 lines long; flowers few, sessile, remote along the upper portion of the axis or its branches; calyx-tube with a hairy ring at the top; calyx-lobes remaining united and turned to one side in anthesis; petals rose-pink, spatulate-obovate, narrowed to a short claw, 4 to 6 lines long; filaments without scales; capsules slender, 4-sided, angular, 11 to 14 lines long.

Wooded slopes, 1000 to 2000 feet: San Diego Co. May.

Note on relationship.—Godetia delicata approaches very closely Godetia epilobioides. It resembles Godetia epilobioides in the narrow leaves and nodding buds, in the sepals which remain united and turned to one side in anthesis, in the hairy (but more conspicuous) ring at the top of the calyx-tube, and in its capsules which are flat-sided and sometimes obviously sulcate. It differs in the spatulate petals which in shape approach those of some species of Clarkia, but this point weighs less when it is remembered that the petals of Godetia epilobioides var. modesta Jepson are furnished with a distinct although short claw.

Locs.—Ramona, *K. Brandegee*; Descanso, *K. Brandegee*; betw. Campo and Potrero.

Refs.—GODETIA DELICATA Abrams, Bull. Torr. Club 32:539 (1905), type loc. betw. Campo and Potrero, San Diego Co., *Abrams* 3710; Jepson, Univ. Cal. Publ. Bot. 2:352 (1907). *Clarkia delicata* Nels. & Mcbr. Bot. Gaz. 65:60 (1918).

8. OENOTHERA L.

Herbs with alternate or basal leaves. Flowers yellow or white, often turning greenish or reddish. Calyx-tube short to extremely elongated, rarely none, mostly deciduous, the lobes 4, reflexed. Petals 4. Stamens 8, equal, or those opposite the petals shorter, mostly versatile, sometimes basifixed. Capsule chartaceous to woody, straight, contorted or spirally coiled, 4-celled, 4-valved, dehiscent. Seeds many, naked.—Species about 90, North and South America, 1 in Tasmania. (Old Greek name for some now unknown plant, from oinos, wine, and thera, hunt or pursuit.)

Bibliog.—Watson, S., Revision of the extra-trop. N. Am. species of Oenothera (Proc. Am. Acad. 8:573–618,—1873). Eastwood, A., Notes on some species of Oenothera (Zoe 3:248–252,—1892). Small, J. K., Oenothera and its segregates (Bull. Torr. Club 23:167–194,—1896). Léveillé, H., Monographie du genre Onothera, 1–466, many unnumbered plates (1902–1913). Nelson, A., Sphaerostigma (Bot. Gaz. 40:54–63,—1905). Davidson, A., Notes on Sphaerostigma (Muhl. 3:105–108,—1907). Bartlett, H. H., Systematic Studies on Oenothera (Rhod. 15:48–53,—1913; 16:33–37,—1914). Brandegee, K., Variation in Oenothera ovata (Univ. Cal. Publ. Bot. 6:41–50, pls. 8–9,—1914). Munz, P. A., A revision of the subgenus Chylismia of the genus Oenothera (Am. Jour. Bot. 15:223–240,—1928); Revision of N. Am. species of subgenus Sphaerostigma, genus Oenothera (Bot. Gaz. 85:233–270,—1928); A revision of the subgenera Taraxia and Eulobus of the genus Oenothera (Am. Jour. Bot. 16:246–257,—1929); The N. Am. species of the subgenera Lavauxia and Megapterium of the genus Oenothera (Am. Jour. Bot. 17:358–370,—1930); The subgenus Anogra of the genus Oenothera (l.c. 18:309–327,—1931); The subgenus Pachylophis of the genus Oenothera (l.c. 18:728–748,—1931).

A. Stigma divided into 4 linear lobes; capsule sessile or nearly so.

1. Plants with stems bearing leaves and flowers; calyx-tube ¾ to 1½ inches long.

Flowers yellow, the buds erect; stems tall, 1½ to 5 feet high; seeds in 2 rows in each cell; biennial. —Subgenus ONAGRA........1. *O. hookeri.*

Flowers white, the buds nodding; stems low; capsules linear, smooth; seeds in 1 row in each cell. —Subgenus ANOGRA.

Tips of calyx-lobes not free in the bud; pubescence usually spreading; stems sparsely leafy; annual........2. *O. trichocalyx.*

Tips of calyx-lobes free in the bud; pubescence appressed; stems very leafy; perennial........3. *O. californica.*

2. Plants with the leaves and flowers borne at the ground in a basal tuft or rosette on the root-crown; flower-buds erect; seeds in two rows in each cell; perennials; deserts and east side of the Sierra Nevada or its easterly crests.

Tips of calyx-lobes not free in the bud; seeds not angled.—Subgenus PACHYLOPHIS

Flowers yellow; leaves deeply and regularly pinnate (the lobes numerous and well-developed) or sometimes sublyrate; capsules not winged, the angles with a small rounded or acutish ridge.......4. *O. primiveris.*

Flowers white; capsules with the angles more or less winged or tuberculate.

Calyx-tube 1 to 2 inches long; capsules long-beaked, with thick entire wings below; herbage finely pubescent.......5. *O. xylocarpa.*

Calyx-tube 3 to 5½ inches long; capsules shortly beaked, the angles with a coarsely-toothed narrow wing or with tubercles; herbage commonly pilose.......6. *O. caespitosa.*

Tips of calyx-lobes free in the bud; calyx-tube 2 to 4 inches long; seeds evidently angled; herbage glabrous or glabrate.—Subgenus LAVAUXIA.......7. *O. flava.*

B. Stigma capitate or discoid.

1. Calyx-tube slender or filiform, ½ to 4 inches long, 3 to 5 times the length of the ovary; capsules sessile or nearly so; seeds in 2 rows in each cell.—Subgenus TARAXIA.

Perennials; leaves and flowers borne in a rosette or tuft on the ground; leaves evidently narrowed to a petiole; capsule not winged.

Leaves deeply pinnatifid; capsule densely pubescent.......8. *O. tanacetifolia.*

Leaves entire or with 1 or 2 small lobes or teeth; capsule glabrous.

Capsule linear, 2 lines wide, at maturity shrunken about the seeds; seeds with a scurfy bran-like surface; petioles pubescent; coastal.......9. *O. ovata.*

Capsule oblong to ovate, 3 to 4 lines wide, not at all shrunken about the seeds; seeds smooth, favose-pitted; petioles glabrous; high montane.......10. *O. subacaulis.*

Annuals; leaves and flowers borne in a tuft on the root-crown or short stem or on its very short (¼ to 2 inches long) branches; leaves linear (1 to 3 lines wide), not narrowed to a petiole; capsule short, obovoid-quadratish, with 4 thick obliquely truncate wings.

Petals 4 to 5 lines long; leaves 1 to 4 inches long; stems very short, commonly unbranched, but if branched, the branches slender; cismontane.......11. *O. graciliflora.*

Petals 1 to 2 lines long; leaves 1 to 1½ inches long; stems commonly with several very stout horizontal branches; deserts.......12. *O. palmeri.*

2. Calyx-tube obconic or narrow-funnelform, ½ to 2 lines long, less than half the length of the ovary; seeds in 1 row in each cell; annuals except no. 14.

Capsules sessile or nearly so.

Stamens with anthers all alike.—Subgenus SPHAEROSTIGMA.

Flowers yellow, solitary in the axils of the leafy stems.

Capsules evidently quadrangular; low, more or less spreading plants; leaves entire or sinuate-toothed; capsule contorted, the base of it ascending.

Petals 2 lines long.......13. *O. micrantha.*

Petals 3 to 10½ lines long.

Leaves white-pubescent; perennial.......14. *O. cheiranthifolia.*

Leaves green or greenish; annual.......15. *O. bistorta.*

Capsules terete, or at least not evidently quadrangular; stem leafy to the top, the leaves of the inflorescence scarcely shorter than those below.

Petals 3 to 8 lines long.......16. *O. dentata.*

Petals 1 to 2 lines long.

Capsules linear, more or less curved, 8 to 18 lines long; petals 1½ to 2 lines long.......17. *O. contorta.*

Capsules lanceolate, straight, 3 to 6 lines long; petals about 1 line long.......18. *O. andina.*

Flowers white (rarely yellow), borne in terminal spikes, the spikes commonly nodding in the bud; stems with the leaves strongly reduced above or inconspicuous.

Flowers minute (petals about 1 line long); spikes very loose; capsules terete, straight, ascending.......19. *O. chamaenerioides.*

Flowers conspicuous (petals 2 to 3 lines long).

Capsules quadrangular, or subterete, all ascending (or at least the base of them); spikes densely flowered.......20. *O. alyssoides.*

Capsules terete, commonly refracted (at least some of the lowest); spikes rather loosely flowered.......21. *O. refracta.*

Stamens alternate petals with oblong anthers, those opposite petals with smaller globose anthers.—Subgenus EULOBUS.......22. *O. leptocarpa.*

Capsules long-pediceled; flowers in dense terminal spikes, the spikes nodding at tip; desert species.—Subgenus CHYLISMIA.

Flowers axillary; seeds oblong, winged.......23. *O. pterosperma.*

Flowers in terminal racemes or panicles; seeds obovoid, rounded or angled, not winged.

- Petals yellow, with 2 brown spots at base; leaves linear or nearly so, not obviously veined.........24. *O. kernensis.*
- Petals without brown spots at base; leaves obviously veined.
  - Leaf-blades orbicular-cordate, scattered; under side of leaves green-veined; petals yellow or reddish.........25. *O. cardiophylla.*
  - Leaf-blades oblong to ovate and more or less pinnatifid, usually more or less basally clustered or on lower part of stem; under side of leaves purple-veined.
    - Petals white, rarely yellow, shortly clawed; capsules a little clavate, 4 to 5 lines long, on pedicels 2 to 7 lines long.........26. *O. scapoidea.*
    - Petals not white, sessile; capsules linear.
      - Petals yellow.
        - Pedicels stout, commonly 1 to 3 lines long; capsules stoutish, commonly 1 to 2¾ inches long.........27. *O. brevipes.*
        - Pedicels capillary, commonly 3 to 6 lines long; capsules slender, commonly 9 to 14 lines long; pedicels commonly 3 to 6 lines long.........28. *O. multijuga.*
      - Petals purplish; capsules not slender, commonly 6 lines long; pedicels 1 to 1½ lines long.........29. *O. heterochroma.*

1. **O. hookeri** T. & G. Tall Evening Primrose. Stem erect, usually simple, 2 to 6 feet high; herbage canescently puberulent and often hirsute; leaf-blades ovate to lanceolate or oblanceolate, 3 to 9 inches long, the lowest drawn down to petioles ½ to 4 inches long; calyx-tube 1 to 2 inches long; calyx-tips free in the bud; petals obcordate, bright yellow (drying pink), 1 (or ½) to 2 inches long and quite as broad, of variable size on one plant; anthers versatile, ½ inch long; style disk-shaped below the cylindric stigmas; capsules obtusely quadrangular, woody, more or less pubescent or hirsute, ½ to 2 inches long, the valves with a strong midrib; seeds sharply angled.

Moist lowlands or along streams, 20 to 6500 feet: almost throughout California, but always absent from the dry floors of cismontane valleys and from the arid plains of the transmontane deserts. East to Colorado, south to Mexico. Flowers nocturnal. May-Oct.

Note on variation.—As it occurs in California, Oenothera hookeri fairly represents, in habit, leafage, inflorescence, flowers and fruit, one natural unit of specific rank, although there are sometimes departures from the prevailing form in leaf breadth and not rarely in pubescence. It is not unlikely that each minor climatic area has its own minute and constant genetical strain. The original Douglas plant (type, Herb. Kew), apparently a nearly unique strain, is very hairy; its free calyx-tips are a little obscured by hairiness, and somewhat coarse. *Bridges* 76 ("California") is like it but has the slender calyx-tips conspicuously free as is usual. By reason of a specimen collected at Santa Cruz (*J. Ball* in 1884), which is markedly hairy and with obscure calyx-tips, it is suggested that Santa Cruz may be the type locality for Oenothera hookeri, since we know that both Douglas and Bridges collected near Santa Cruz. There is a canescent form at San Diego (*Spencer* 113 in part).

Locs.—Coast Ranges: Yreka, *Butler* 1799; Crescent City, *M. S. Baker* 223; Cape Mendocino, *Tracy* 4968; White Sulphur Creek, Napa Valley, *Jepson* 14,492; Lake Merced, San Francisco, *Jepson* 10,244; Purissima Creek, San Mateo Co., *Jepson* 4156; Alvarado, *Jepson* 14,496; Carmel Bay, *E. Ferguson* 299; Santa Lucia Peak, *Jepson* 4743. Great Valley: Andrus Isl., Sacramento Co., *Jepson* 14,494; Sherman Isl., Sacramento Co., *Jepson* 10,225; Exeter, Tulare Co., *Jepson* 13,309. Sierra Nevada: Cooks sta., Amador Co., *K. Brandegee;* Yosemite Valley, *Jepson* 3132; Kings Cañon, *Jepson* 773; Kern Flat, Tulare Co., *Hall & Babcock* 5409. East side of the Sierra Nevada crest: Surprise Valley, Modoc Co., *Jepson* 7846; Janesville, Lassen Co., *T. Brandegee;* Lundy, Mono Co., *Maud Minthorn;* Owens Lake, *Jepson* 5102. S. Cal.: Victorville, Mohave Desert, *Parish* 10,593; Ojai Valley, *Olive Thacher* 30; San Antonio Cañon, San Gabriel Mts., *Peirson* 127; San Bernardino, *Parish;* Strawberry Valley, San Jacinto Mts., *Hall* 2639; Palomar Mt., *Esther Hewlett* 66; Escondido Creek, San Diego Co., *Carl Meyer* 247.

Refs.—OENOTHERA HOOKERI T. & G. Fl. 1:493 (1840), type from Cal., *Douglas;* Jepson, Man. 681, fig. 663 (1925). *O. jepsonii* Greene, Fl. Fr. 211 (1891), type loc. Newtown Ldg., lower Sacramento River, *Jepson.* *O. biennis* var. *grandiflora* Jepson, Fl. W. Mid. Cal. 335 (1901); not O. biennis var. grandiflora Lindl. (1833). *O. grandiflora* Jepson, Fl. W. Mid. Cal. ed. 2, 282 (1911); not O. grandiflora Ait. (1789).

OENOTHERA LACINIATA Hill. var. GRANDIS Britt. Ill. Fl. 2:487,—1897. *O. sinuata* var. *grandiflora* Wats. Proc. Am. Acad. 8:581 (1873), type from Texas.—Mentone, San Bernardino Valley, resting on *Geo. Robertson* acc. Parish (Muhl. 3:60); it is, perhaps, O. californica or O. hookeri.

2. **O. trichocalyx** Nutt. Basket Evening Primrose. (Fig. 256.) Stem simple, short, very thick or even conical, 1 to 2 (or 6) inches high, very densely flowered, commonly developing from beneath this short dense spike several ascending stems 4 to 14 inches (or even 2½ feet) high which are loosely flowered above, and sparsely pilose or almost glabrous; leaf-blades oblong to ovate or lanceolate, tapering to both ends, subentire or rather remotely denticulate to coarsely and saliently toothed or lobed, canescent or pilose, 1 to 7 inches long, margin at first undulate, shortly petioled; calyx-tube ¾ to 1¼ inches long; calyx-tips not free in the bud; bud (just before anthesis) oblong, woolly-pilose; petals ¾ to 1¼ inches long, usually with a deep sinus; capsules very slender, terete, thickened towards the broad sessile base, slightly curved or nearly straight, widely spreading or in maturity strongly deflexed, woody, 1⅛ to 3 (or 4) inches long; seeds narrowly ovate, mottled, somewhat compressed.

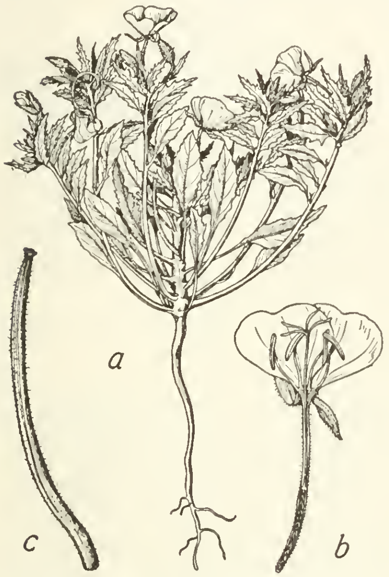


Fig. 256. Oenothera trichocalyx Nutt. *a*, habit, × ⅙; *b*, long. sect. of fl., × ½; *c*, capsule, × ⅔.

Sandy washes or benches and dry mesas, –125 to 1700 feet: upper San Joaquin Valley in Kern Co.; Mohave and Colorado deserts. South to Lower California, east to Wyoming and Mexico. Mar.-June.

Field note.—The most marked natural type behaves as follows: Initially the stem or primary axis is simple, erect, rather short, strongly dilated and rather densely flowered. If the conditions continue favorable for growth secondary or lateral axes are developed in a whorl from the base of the main stem, the flowering portion of these secondary axes becoming markedly dilated. Both the central axis and the laterals are unbranched. Sometimes the entire expression of the plant is thrown into the primary axis and we have a stem 2 feet high, strongly inflated (¾ to 1 inch in diameter) and floriferous and leafy from base to apex.

In 1930 a very large number of fasciated plants, perhaps one hundred, were found near Lavic (west several miles, by the railway line) scattered over a distance of one-fifth mile. We observed that only the central axis was fasciated, this fasciation being ribbon-like. One plant, for example, measured 21 inches high, the ribbon being 9 inches wide at the top. Another plant 12 inches high developed a ribbon 16 inches wide.

Locs.—Kern Co.: Bakersfield plain, *Jepson* 8942. Mohave Desert: Lancaster, *Elmer* 3810; Kramer, *Jepson* 5344; Barstow, *Jepson* 5184; Calico Wash, n. of Daggett, *Jepson* 5406; Lavic, *Jepson* 15,473; betw. Halloran Sprs. and Windmill sta., *Jepson* 15,801; Needles, *Jones* 3870. Colorado Desert: Palm Sprs. of San Jacinto, *Parish* 4107; Borrego Sprs., *T. Brandegee;* San Felipe Wash, *Jepson* 8897; Carrizo Creek, *T. Brandegee;* Brawley, *W. S. Childs;* Holtville (plain e.), *Jepson* 11,719.

Var. **cognata** Jepson. Stems coarse, branching; leaves green and glabrate above and below, or tending to be so, the margins hirsute-ciliate; flowering axes less dilated or not at all.—Sandy fields or stream bottoms, 10 to 400 feet: inner South Coast Ranges, ranging west to the Nacimiento River; San Joaquin Valley.

Locs.—South Coast Ranges: Corral Hollow, Alameda Co., *Brewer* 1217; San Miguel River, *Rhoda Reed* 467. San Joaquin Valley: Antioch, *K. Brandegee;* betw. Mossdale and Atlanta, San Joaquin Co., *Jepson* 14,479; Delhi, Merced Co., *Jepson* 12,745; Huron, Fresno Co., *T. Brandegee;* Bakersfield, *Davy* 1735.

Var. **cineracea** Jepson. Leaves finely strigulose with short appressed hairs.—Western Colorado Desert: Borrego Sprs.

Var. **piperi** Jepson comb. n. Plants usually low, 4 to 6 inches high, the stems often simple; pubescence on upper portions long, arcuate; upper leaves deeply and regularly sinuate-dentate to pinnatifid; petals about ¾ inch long; capsules ½ to 1¼ inches long.—Sandy flats or slopes, 3000 to 4000 feet: east slope of Sierra Nevada and east or north of its crest from Inyo Co. to Siskiyou Co. North to eastern Oregon, east to western Nevada.

Locs.—Olancha, Inyo Co., *T. Brandegee;* Woodford, Alpine Co., *Ottley* 1135; Constantia, Lassen Co., *Kennedy;* Siskiyou Co., *Butler* 2000 (intermediate toward var. cognata).

Refs.—OENOTHERA TRICHOCALYX Nutt.; T. & G. Fl. 1:494 (1840), type loc. "plains of the Platte in the Rocky Mts.", *Nuttall;* Jepson, Fl. W. Mid. Cal. 336 (1901), ed. 2, 282 (1911), Man. 681 (1925). *Anogra trichocalyx* Small, Bull. Torr. Club 23:174 (1896). *O. deltoides* Torr. & Frem.; Frem. Rep. 315 (1845), type coll. by *Fremont*, probably Mohave Desert. *Anogra deltoides* Small, Bull. Torr. Club 23:174 (1896). *O. trichocalyx* f. *albicaulis* Lévl. Monog. Onoth. 346 (1909), type from Cal., "desert", *Parish.* *O. trichocalyx* f. *refracta* Lévl. l.c., type loc. Whitewater. *O. trichocalyx* f. *mollis* Lévl. l.c., type loc. Palm Sprs. of San Jacinto, *Parish.* Var. COGNATA Jepson, Man. 681 (1925), type loc. Corral Hollow, Contra Costa Co., *Brewer* 1217. *O. deltoides* var. *cognata* Munz, Am. Jour. Bot. 18:313 (1931). Var. CINERACEA Jepson, Man. 681 (1925), type loc. Borrego Sprs., Colorado Desert, *T. Brandegee.* *O. deltoides* var. *cineracea* Munz, Am. Jour. Bot. 18:316 (1931). Var. PIPERI Jepson. *O. deltoides* var. *piperi* Munz, Am. Jour. Bot. 18:314 (1931), type loc. Man's Lake, e. Ore., *Cusick* 2566. *O. trichocalyx* f. *acaulis* Lévl. Monog. Onoth. 346 (1909), type loc. Sierra Valley, *Lemmon.*

3. **O. californica** Wats. Stems branching, 6 to 22 inches high, ascending from a perennial slender deep-seated branched rootstock; leaf-blades narrowly to broadly lanceolate or oblanceolate, entire, remotely denticulate, or pinnately lobed or toothed, ashy with a dense short strigose pubescence, 1 to 4 inches long, sessile or shortly petioled; flowers several, axillary, vespertine; calyx-tips free in the bud; buds oblong to narrowly ovate, canescent and often shaggy-pilose; calyx-tube ¾ to 1½ inches long; petals white, turning pink, broader than long, 1 to 1½ inches long; capsules narrow-linear, 8-ribbed, obtusely quadrangular or teretish, ascending but somewhat curved, sessile, 1 to 2¼ inches long, not thickened at base; seeds oblong, turgid, smooth, one row in each cell.

Sandy soil, valleys, desert washes and mountain flats, 20 to 7000 feet: coastal Southern California; Mohave Desert; north to Contra Costa and Mono Cos. East to Nevada, south to Lower California. Apr.-July.

Locs.—Jacumba, San Diego Co., *T. Brandegee;* Grapevine Spr., e. of Warner Pass, *Jepson* 8756; Santa Rosa Indian Village, Santa Rosa Mts., *Jepson;* San Jacinto, *Jepson* 1249; Riverside, *F. M. Reed* 260; Mill Creek Cañon, San Bernardino Mts., *R. J. Smith* 103; San Bernardino Valley, *Parish;* Cajon Pass, *Peirson* 387; Big Pines Camp, San Gabriel Mts., *Epling, Dunn and Goen;* Aliso Cañon, San Gabriel Mts., *Barber* 197b; Mt. Pinos, Ventura Co., *C. L. Hitchcock* 113; Antioch, *Chesnut & Drew;* Sacramento, *Shockley;* Mohave, *F. P. Morse;* Barstow, *Jepson* 5845; Barnwell, e. Mohave Desert, *K. Brandegee;* Argus Mts., Inyo Co., *Purpus* 5416; Kernville, *T. Brandegee;* betw. Bishop and Anderson Camp, *K. Brandegee;* Convict Creek, se. Mono Co., *Almeda Nordyke.*

Var. **glabrata** Munz. Herbage bright green, glabrous or subglabrous; buds glabrous.—Sandy plains and flats, 100 to 1400 (or 6500) feet: Santa Cruz Mts.; San Gabriel Mts. to the San Bernardino Valley and the Santa Rosa Mts.

Locs.—Pajaro Valley, near Watsonville, *A. O'Neil;* Aliso Cañon, San Gabriel Mts., *Barber* 197a; Cajon Pass, *Hall* 3013; San Bernardino, *Parish* 8544; Riverside, *Hall* 4952; Santa Rosa Mt., *Clary* 2a.

Refs.—OENOTHERA CALIFORNICA Wats.; B. & W. Bot. Cal. 1:223 (1876); Jepson, Fl. W. Mid. Cal. 336 (1901), ed. 2, 282 (1911). *O. albicaulis* var. *californica* Wats. Proc. Am. Acad. 8:582 (1873), type from Cal., no locality stated, probably Los Angeles, *Wallace* (l.c. 602). *Anogra californica* Small, Bull. Torr. Club 23:176 (1896). *O. pallida* var. *californica* Jepson, Man. 681 (1925). *O. missouriensis* race *fremontii* f. *californica* Lévl. Monog. Onoth. 435 (1913). *O. albicaulis* race *transiens* var. *melanosperma* Lévl. Monog. Onoth. 342 (1909), type loc. Bear Valley, San Bernardino Mts., *Parish.* Var. GLABRATA Munz, Am. Jour. Bot. 18:327 (1921), type loc. San Bernardino, *Parish* 4177.

OENOTHERA SPECIOSA Nutt. Jour. Acad. Phila. 2:119 (1821), type loc. "on the plains of the Red River" (Arkansas), *Nuttall.* Herbage more or less canescent; flowers white or rose, 1½ to 3½ inches broad, diurnal; calyx-tube funnelform, stalked, as long as ovary; capsules ½ to ¾ inch long, acute at apex, 8-winged.—Occasional escape from cultivation: betw. Chino and Pomona, *Munz* 4560.

4. **O. primiveris** Gray. Leaves in a basal tuft, these and the flowers borne on the very short thick-conical axis of the root-crown; herbage more or less pilose, sometimes densely so; leaf-blades lanceolate or oblong in outline, unequally and usually deeply pinnatifid, less commonly subentire or denticulate, 1 to 6 inches long, on petioles ¼ to 2 times as long; flowers vespertine; calyx-tube 1½ to 2 inches

long; petals yellow, aging pinkish, 1 to 1⅛ inches long; capsules oblong-ovate or oblong-lanceolate, strongly 4-sided or quadrangular, straight or only very slightly curved, with a round or acutish ridge on the angles, 1 to 1¾ inches long; seeds irregularly tuberculate.

Sandy soil, 2000 to 3000 feet: Inyo Co., south through the Mohave Desert to the Colorado Desert, then entering San Gorgonio Pass. East to western Texas, south to Mexico and Lower California. Mar.-May.

Locs.—Inyo Co.: Darwin Mesa, *R. S. Ferris* 7835. Mohave Desert: Goffs, *Parish* 9646; Barstow, *Jepson* 6146; Kramer, *Jepson* 5342; betw. Randsburg and Rand, Kern Co., *K. Brandegee;* Mohave sta., *F. P. Morse.* Colorado Desert: Shavers Well (Am. Jour. Bot. 18:736). Cismontane S. Cal.: Banning, San Gorgonio Pass (Am. Jour. Bot. 18:736).

Refs.—OENOTHERA PRIMIVERIS Gray, Pl. Wright. 2:58 (1853), type loc. El Paso, Tex., *Wright* 1376; Jepson, Man. 682 (1925). *Lavauxia primiveris* Small, Bull. Torr. Club 23:182 (1896). *O. caespitosa* var. *primiveris* Lévl. Monog. Onoth. 71 (1902). *O. bufonis* Jones, Contrib. West. Bot. 8:28 (1898), type loc. Darwin Mesa, Argus Mts., *Jones. Lavauxia lobata* Nels. Bot. Gaz. 47:429 (1909), type loc. Meadow Valley Wash, s. Nev., *Goodding* 37, 47.

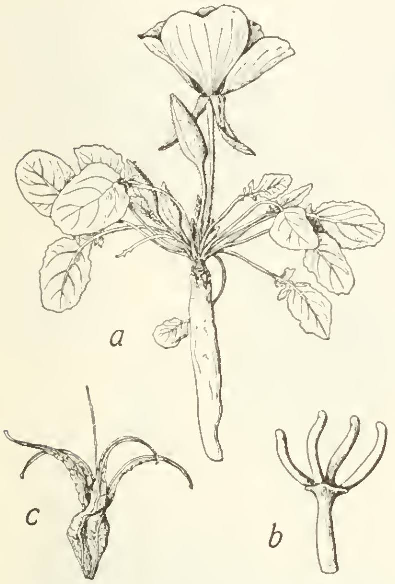


Fig. 257. OENOTHERA XYLOCARPA Cov. *a*, habit, × ⅓; *b*, stigma, × 2; *c*, dehiscing capsule, × ⅓.

5. **O. xylocarpa** Cov. KERN EVENING PRIMROSE. (Fig. 257.) Leaves and sessile flowers borne in a tuft on the crown of the very stout root; leaf-blades elliptic to ovate, obtuse or acute, ½ to 2¼ inches long, commonly with several small irregular supplementary lobes at base and thus lyrately pinnatifid, puberulent; petioles longer than the blades or nearly as long; calyx-tube 1 to 2 inches long; petals yellow, aging orange-red, 1 to 1½ inches long; capsules thick-lanceolate, long-attenuate, curved or contorted, 2½ to 3 inches long, the angles developed into thick somewhat undulate wings, the back of each valve prominently ribbed; seeds minutely tuberculate.

Sandy or gravelly flats, 8000 to 9800 feet: Sierra Nevada from eastern Tulare Co. to Mono Co. East to western Nevada. June-Aug.

Field note.—The flowers open most freely at five o'clock in the afternoon, remaining open all night, some of them remaining open all the next day. The corolla is white, turning yellow after anthesis and finally pink-red, being closed or half-closed after the white stage. The midvein of the obcordate petals is carinate on the upper surface in such a way that the petals are not plane, so that the flower in aspect is different from the flowers of the allied species.—Jepson Field Book, 25:101, ms., Volcano Creek, July 3, 1912.

Locs.—Fish Creek, se. Tulare Co., *Hall & Babcock* 5214; Ground-hog Mdw., Volcano Creek, Kern River, *Jepson* 4948; Bishop (35 mi. n.), Mono Co., *Munz* 11,084.

Refs.—OENOTHERA XYLOCARPA Cov. Contrib. U. S. Nat. Herb. 4:105, pl. 8 (1893), type loc. Whitney Mdws. (Volcano Mdws.), Tulare Co., *B. H. Dutcher;* Jepson, Man. 682 (1925). *Anogra xylocarpa* Small, Bull. Torr. Club 23:174 (1896).

6. **O. caespitosa** Nutt. (Fig. 258.) Leaves in a basal rosette, these and the flowers borne in a tuft on the short axis of the root-crown; herbage green, pilose-pubescent or glabrate; leaf-blades ovate to lanceolate in outline, coarsely and irregularly or often sparsely dentate, sometimes subentire, 1 to 4 inches long, narrowed to a petiole half to as long; flower-buds strongly 4-sided; tips of calyx-lobes not free in the bud; calyx-tube 3 to 5½ inches long, dilated upward into a narrow-funnelform dilation; petals white, turning pink, 1 to 1¾ inches long; capsules oblong or linear to narrow-ovate, obtusely quadrangular, 1 to 1¾ inches long, the

angles with 2 narrow coarsely toothed wings, or the angles merely warty; seeds minutely and densely tubercled.

Sandy desert slopes, plains and washes, 2000 to 7500 feet: San Bernardino Mts.; Mohave Desert; north to Inyo Co. and along the east side of the Sierra Nevada to Modoc Co. North to Washington, east to Montana and New Mexico. May-July.

Locs.—San Bernardino Mts.: Bear Valley, *Munz* 5678; upper Holcomb Valley, *Munz* 10,636. Mohave Desert: Kramer, *K. Brandegee;* Providence Mts., *T. Brandegee;* Barnwell, New York Mts., *Jepson* 5460; Piute Creek, *N. C. Wilson.* East side of Sierra Nevada: Hanaupah Cañon, Panamint Range, *Jepson* 6963; Wild Rose Cañon, Panamint Range, *Parish* 9895; Darwin (n. of), *Hall & Chandler* 7111; Laws, Inyo Co., *K. Brandegee;* Truckee River Cañon, *K. Brandegee;* Likely, Modoc Co., *Manning.*

Refs.—OENOTHERA CAESPITOSA Nutt. Fraser Cat. n. 53 (1813); Sims, Bot. Mag. t. 1593 (1814), type loc. "Upper Louisiana", *Nuttall;* Nutt. Gen. 1:245 (1818), type loc. "banks of the Missouri from White River to the Mandans", *Nuttall.* *O. marginata* Nutt.; H. & A. Bot. Beech. 342 (1838), type loc. Blue Mts., e. Ore., *Tolmie;* T. & G. Fl. 1:500 (1840), "Rocky Mts., in Upper California, about lat. 42°", *Nuttall.* *Pachylophus marginatus* Rydb. Bull. Torr. Club 33:146 (1906). *O. caespitosa* var. *marginata* Munz, Am. Jour. Bot. 18:733 (1931). *P. cylindrocarpus* Nels. Bot. Gaz. 47: 429 (1909), type loc. Carsons, Meadow Valley Wash, s. Nev., *Goodding.* *Anogra longiflora* Hel. Muhl. 2:224 (1906), type loc. Silver Cañon, White Mts., *Heller* 8219, a nearly glabrous form. *O. caespitosa* var. *longiflora* Munz, Am. Jour. Bot. 18:734 (1931).

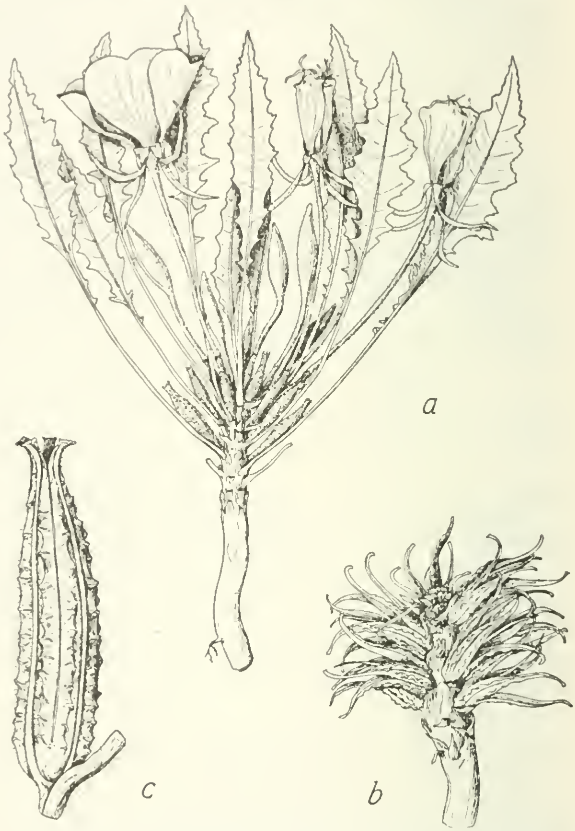


Fig. 258. OENOTHERA CAESPITOSA Nutt. *a*, habit, × ¼; *b*, spike of old fruits, × ½; *c*, capsule, × 1.

7. **O. flava** Garrett. Leaves and flowers borne in a tuft on the root-crown; herbage glabrous or subglabrous; leaf-blades lanceolate in outline, deeply and irregularly pinnatifid below the entire apical portion, sometimes merely salient-dentate below, sometimes more or less bipinnatifid throughout, 3 to 7½ inches long, on petioles ½ to 3 inches long; flowers diurnal; calyx-tube 2 to 4 inches long; petals yellow, aging pinkish, 10 to 16 lines long; capsules ovate to broadly oblong, angles winged, sides prominently ribbed and reticulate-veined, 6 to 10 lines long; seeds angled, minutely and densely tuberculate.

Plateau country, 3400 to 5000 feet: northern Sierra Nevada from Eldorado Co. to Shasta and Modoc Cos. East to the Rocky Mts., north to Washington, south to Mexico. May-Aug.

Locs.—Mt. Ralston, Eldorado Co., *H. M. Evans;* Sierra Valley, Sierra Co., *Lemmon;* Fall River Sprs., ne. Shasta Co., *Hall & Babcock* 4198; Dixey Mts., Lassen Co., *Baker & Nutting;* Bieber Range, Modoc Co., *L. S. Smith;* Alturas, *C. C. Bruce;* Forestdale, sw. Modoc Co., *M. S. Baker.*

Refs.—OENOTHERA FLAVA Garrett, Spring Flora Wasatch Reg. ed. 4, 106 (1927). *Lavauxia flava* Nels. Bull. Torr. Club 31:243 (1904), type loc. Laramie, Wyo., *Nelson* 219. *O. triloba* Jepson, Man. 682 (1925); not Nuttall (1821).

8. **O. tanacetifolia** T. & G. Leaves in a basal rosette, these and the sessile flowers crowded on the root-crown; herbage canescent to scantily puberulent; leaf-blades narrow-oblanceolate, irregularly and unequally pinnatifid or pinnately divided, 1½ to 4 inches long, on petioles ¼ to 2 inches long; calyx-tube 1 to 2 inches long; petals yellow, aging yellowish or pinkish, 5 to 8 lines long; capsules narrow-ovate to broadly lanceolate, quadrangular, 5 to 10 lines long; seeds minutely and regularly areolate.

Valleys and hill slopes, 4200 to 6500 feet: easterly summits or eastern slope of the Sierra Nevada from Nevada Co. to Modoc Co. and eastern Siskiyou Co. North to Washington, east to Nevada and Idaho. June-Aug.

Locs.—Truckee, Nevada Co., *Sonne;* Sierra Valley, Sierra Co., *Lemmon;* Beckwith Pass, *Jepson* 7767; Norval Flat (near Westwood Jct.), sw. Lassen Co., *C. S. Robinson* 38; Eagle Lake, *M. S. Baker;* Grasshopper Valley, Lassen Co., *Jepson* 7998; Madeline plains, *Loughridge;* Alturas, *L. S. Smith* 926; Mt. Bidwell, ne. Modoc Co., *Manning* 339; Medicine Lake, e. Siskiyou Co., *M. S. Baker* 485.

Refs.—OENOTHERA TANACETIFOLIA T. & G. Pac. R. Rep. 2:121, pl. 4 (1855), type loc. "higher parts of Sierra Nevada" (probably in Lassen Co.), *Snyder;* Jepson, Man. 683 (1925). *Taraxia tanacetifolia* Piper, Contrib. U. S. Nat. Herb. 11:405 (1906). *O. nuttallii* T. & G. Fl. 1:506 (1840), type loc. "plains in the Rocky Mts. near Blackfoot River", *Nuttall;* not O. nuttallii Sweet (1830). *Taraxia longiflora* Nutt.; T. & G. Fl. 1:506 (1840) as synonym; not O. longiflora L. (1771).

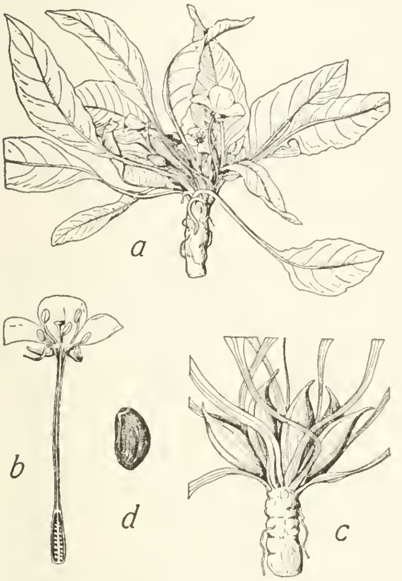


Fig. 259. OENOTHERA SUBACAULIS Garrett. *a,* habit, × ⅓; *b,* long. sect. of fl., × ⅔; *c,* base of plant showing capsules, × ⅔; *d,* seed, × 5.

9. **O. ovata** Nutt. GOLDEN EGGS. Leaves in a basal rosette, these and the flowers arising from the crown of the thick root; herbage glabrous or the leaf margins and veins beneath ciliate; leaf-blades oblong to ovate, acute, entire or subentire, 3 to 6 inches long, the under ones of the rosette narrowed at base to rather long petioles; calyx-tube very slender, 3 to 4 inches long, the segments glabrous; petals orbicular, ½ inch long; capsules more or less below the surface of the ground, chartaceous, 1 inch long, tardily dehiscent.

Open hill slopes or low flats, mostly toward the coast, 100 to 1500 feet: San Luis Obispo Co. to Humboldt Co. North to southwestern Oregon. Feb.-Apr.

Locs.—Oso Valley, San Luis Obispo Co., *Condit;* Pacific Grove, *Elmer* 3510; San Juan, San Benito Co., *Jepson* 8429; Stanford, *Elmer* 4626; Millbrae, San Mateo Co., *Davy* 1018; Mt. Davidson, San Francisco Co., *Jepson* 10,362; Berkeley, *Jepson* 14,480; Angel Isl., *Brewer* 2760; Alto sta., Mt. Tamalpais, *Jepson* 11,564; Inverness, *Jepson;* St. Helena, *Jepson* 9885; Willits, *Jepson;* Sherwood Valley, Mendocino Co., *Jepson;* Fortuna, Humboldt Co., *Tracy* 2433.

Refs.—OENOTHERA OVATA Nutt.; T. & G. Fl. 1:507 (1840), type loc. Monterey, *Nuttall;* Jepson, Fl. W. Mid. Cal. 336 (1901), ed. 2, 282 (1911), Man. 683, fig. 664 (1925). *Taraxia ovata* Small, Bull. Torr. Club 23:185 (1896). *O. primuloidea* Lévl. Monog. Onoth. 65 (1902) as to western Cal. plants.

10. **O. subacaulis** Garrett. (Fig. 259.) Leaves in a broad rosette, these and the flowers seated on the root-crown; herbage glabrous or nearly so; leaf-blades lanceolate to narrow-ovate, entire or denticulate, or with 2 or 3 pairs of small supplementary lobes at base, 1¼ to 5 inches long, on petioles ⅓ to ⅔ as long; calyx-

tube slender or filiform, 1 to 2½ inches long; petals yellow, aging pale yellow or white, 3½ to 7 lines long; capsules oblong to elliptic or ovate, quadrangular, smooth or more or less rugulose, ridged on the angles, 6 to 9 lines long; seeds yellowish, favose-pitted.

Moist meadows, 4000 to 8000 feet: easterly summits or east side of the Sierra Nevada from Tulare Co. to Modoc Co. North to Washington, east to Montana and Colorado. June-July.

Locs.—Ramshaw Mdws., near Kern Peak, *Jepson* 4963; West Fork Carson River, Alpine Co., *Munz* 11,086; Donner Lake, *Sonne;* Little Truckee River, Sierra Co., *Sonne;* Mineral, Tehama Co., *J. Grinnell;* Forestdale, sw. Modoc Co., *M. S. Baker;* Lake City Mt., Modoc Co., *C. C. Bruce* 2203.

Refs.—OENOTHERA SUBACAULIS Garrett, Spring Flora Wasatch Reg. 64 (1911); Jepson, Man. 683 (1925). *Jussieua subacaulis* Pursh, Fl. 304 (1814), type loc. "banks of the Missouri", *M. Lewis*. *Taraxia subacaulis* Rydb. Mem. N. Y. Bot. Gard. 1:281 (1900). *O. heterantha* Nutt. Jour. Acad. Phila. 7:22 (1834), type loc. "toward the sources of the Columbia", *Wyeth*. *Taraxia heterantha* Small, Bull. Torr. Club 23:185 (1896). *O. primuloidea* Lévl. Monog. Onoth. 65 (1902). *O. heterantha* var. *taraxacifolia* Wats. Proc. Am. Acad. 8:589 (1873), type loc. Austin, Nev., *Watson* 418 in part (Wats. l.c. 609). *Taraxia heterantha taraxifolia* Small, Bull. Torr. Club 23:185 (1896). *O. subacaulis* var. *taraxacifolia* Jepson, Man. 683 (1925).

11. **O. graciliflora** H. & A. HILL SUN-CUP. Leaves and sessile flowers in a tuft, crowded on the root-crown or on the short (¼ inch long) branches; herbage hirsute-pubescent; leaf-blades erect or ascending, linear, entire or sometimes obscurely denticulate, 1 to 4½ inches long, sessile; calyx-tube filiform, ½ to 1⅜ inches long, the segments hirsute-pubescent; petals broadly obovate, the broad shallow notch at apex with a middle tooth or acumination, 3 to 5 lines long; capsules quadratish in outline, with a short wing-like tooth on the angles near the summit, coriaceous, 3 to 6 lines long.

Sandy or gravelly soil of the hill country and rolling plains, 50 to 2600 feet: Coast Ranges, especially the inner ranges, from San Luis Obispo Co. to Siskiyou Co.; Tehachapi Mts.; Sierra Nevada foothills from Kern Co. to Shasta Co. North to Oregon. Mar.-June.

Locs.—Coast Ranges: Arroyo Grande, San Luis Obispo Co., *Alice King;* Alcalde, sw. Fresno Co., *T. Brandegee;* Lewis Creek, s. San Benito Co., *Jepson* 16,150; San Antonio Valley, Monterey Co., *Marion Parsons;* Evergreen, Santa Clara Co., *Davy* 89; Corral Hollow, Mt. Hamilton Range, *Jepson* 9560; Grizzly Peak, Berkeley, *Jepson* 15,710; Antioch, *Davy* 904; Kelseyville, Lake Co., *H. Irwin* 65; Potter Valley, Mendocino Co., *Nettie Purpus;* Cottonwood Creek, Yollo Bolly foothills, w. Tehama Co., *Jepson* 14,489; Humbug, Siskiyou Co., *Butler* 648. Tehachapi Mts.: Girard sta., Kern Co., *K. Brandegee;* Caliente, *T. Brandegee*. Marysville Buttes: South Peak, *Jepson* 14,490. Sierra Nevada foothills: Greenhorn Mts., *Purpus;* Kaweah, *Hopping* 256; Newcastle, Placer Co., *Bolander* 4564; Brush Creek, Butte Co., *Conger;* Fall River Valley, ne. Shasta Co., *M. S. Baker*.

Refs.—OENOTHERA GRACILIFLORA H. & A. Bot. Beech. 341 (1838), type from Cal., *Douglas;* Hook. Icon. Pl. t. 338 (1841); Jepson, Fl. W. Mid. Cal. 336 (1901), ed. 2, 283 (1911), Man. 683, fig. 665 (1925). *Taraxia graciliflora* Raim.; Engler & Prantl, Nat. Pflzfam. 3^7:216 (1893).

12. **O. palmeri** Wats. RAGGED SUN-CUP. Stem branched at the ground into several short very stout horizontal or contorted branches ¼ to 2 inches long, the bark white, exfoliating; leaf-blades linear (or oblanceolate), entire or obscurely denticulate, exceeded in width by the broad sessile leaf base, minutely strigulose, 1 to 1½ inches long; calyx-tube filiform, 6 to 8 lines long; petals yellow, 1 to 2½ lines long; capsules ovate, 2½ to 4 lines long, coriaceous, quadrangular, the angles with a thick obliquely truncate wing; seeds minutely roughened.

Sandy soil, 2000 to 4000 feet: Mohave Desert; Inyo Co. North through Nevada to Oregon, east to Arizona. Apr.-June.

Locs.—Antelope Valley, Los Angeles Co., *Parish* 1895; Mohave sta., Kern Co., *Heller* 7757; betw. Randsburg and Rand, Kern Co., *K. Brandegee;* Granite Wells, *Johnston* 6479; Argus Peak, Inyo Co., *Hall & Chandler* 6895.

Refs.—OENOTHERA PALMERI Wats. Proc. Am. Acad. 12:251 (1877), type from Ariz., *Palmer;* Jepson, Man. 683 (1925). *Taraxia palmeri* Small, Bull. Torr. Club 23:184 (1896).

13. **O. micrantha** Hornem. FIELD SUN-CUP. Stems 1 to several from the base, procumbent or diffuse, 8 to 24 inches long; herbage thinly hirsutulous or strigulose; leaf-blades ovate- to narrow-lanceolate, slightly undulate, more or less denticulate, 1 to 3½ inches long, the upper mostly sessile, the lower narrowed to a petiole; calyx-tube ¾ to 1 line long; petals entire or emarginate, 1 to 2 lines long; capsules sharply 4-angled, contorted, often coiled into a single spiral, slightly attenuate upwards, sparsely hirsutulous, ½ to 1 inch long.

Sandy hills and fields, 5 to 2500 feet: San Francisco and Contra Costa Cos. to San Luis Obispo Co.; coastal Southern California. South to Lower California. Mar.-June.

Locs.—South Coast Ranges: Antioch, *Chesnut & Drew;* Lands End, San Francisco, *Davy;* San Pedro, San Mateo Co., *Elmer* 4813; Corralitos, Santa Cruz Co., *M. S. Baker;* Pajaro Hills, Monterey Co., *Chandler* 386; Carmel River, near Carmel, *Jepson* 14,485; Bear Valley, San Benito Co., *Jepson* 12,246; San Miguelito Rancho, near Jolon, *Jepson* 1646; Arroyo Grande, *Alice King;* Cuyama Valley, se. San Luis Obispo Co., *Jepson* 12,159. Coastal S. Cal.: Purisima Hills, n. Santa Barbara Co., *Jepson* 11,922; Sycamore Cañon, Santa Inez Mts., *Jepson* 9160; Los Alisos Cañon, Santa Monica Mts., *Epling;* Tujunga Cañon, San Gabriel Mts., *Peirson* 414; Fallbrook, *Jones;* Mt. Soledad, w. San Diego Co., *Newlon* 316.

Var. **ignota** Jepson. Stems usually simple, erect; herbage pubescent to subglabrous; leaves usually sparser; petals 1½ to 3½ lines long; capsules purplish.—Valley mesas and mountain slopes, 1300 to 5200 feet: southern Sierra Nevada from Madera Co. to Kern Co.; interior of coastal Southern California. South to Lower California. Apr.-June.

Locs.—Sierra Nevada: Friant (Pollasky), Madera Co., *Heller* 8166; Tehipite Valley, *Hall & Chandler* 508. S. Cal.: Saugus, *Munz* 10,013; Slover Mt., Colton, *Parish* 73; Riverside, *Jepson* 1219; Moro Hills, Fallbrook, San Diego Co., *Abrams* 3326; Buckman Sprs., San Diego Co., *Munz* 9638.

Var. **exfoliata** Munz. Leaf-blades linear to lanceolate, narrowed at base to a petiole, usually entire, gray with a close short pubescence, 1 to 3½ (or 6) inches long; upper leaves often sessile; petals 1½ to 3 lines long.—Sandy washes, deserts or desert borders, 500 to 3300 feet: Mohave Desert; Colorado Desert. East to Arizona. Apr.-May.

Locs.—Mohave Desert: Providence Mts., *Munz & Harwood* 3442; Manzana, Antelope Valley, *Davy* 2506. Colorado Desert: Smith Water Cañon, Little San Bernardino Mts., *Munz* 5223; Point of Rocks, Whitewater Wash, *Schellenger;* Palm Sprs. of San Jacinto, *Parish* 20,022; Coyote Cañon, sw. of Santa Rosa Mts., *Hall* 2791; San Felipe Creek, e. San Diego Co., *T. Brandegee;* Vallecito, e. San Diego Co., *Jepson* 8592.

Var. **jonesii** Munz. Stems flowering from the base or near it, thinly hispid-hirsute; leaf-blades oblong-ovate, often subcordate at the sessile base, crenately toothed, crisped, 6 to 12 lines long, the basal oblong or oblong-spatulate, narrowed to a petiole, 1 to 2½ inches long.—Washes, exposed slopes and chaparral burns, 300 to 5000 feet: Coast Ranges from Mendocino and Lake Cos. to San Luis Obispo Co.; Sierra Nevada from Amador Co. to Kern Co.; coastal Southern California. East to Nevada, south to Lower California.

Locs.—Coast Ranges: South Mill Creek, Ukiah, *Jepson* 9252; Blue Lakes, Lake Co., *Jepson* 14,483; Knoxville, ne. Napa Co., *Jepson;* Vaca Mts., *Jepson* 14,482; Mt. Diablo, *Jepson* 9520; San Miguel, San Luis Obispo Co., *E. P. Unangst.* Sierra Nevada: Drytown, Amador Co., *Hansen* 543; Cosumne River, *Rattan;* Gwin Mine, Calaveras Co., *Jepson* 1798; South Fork Bridge, Tuolumne Co., *A. L. Grant* 843; Greeley Hill, Coulterville, *Jepson* 14,481; Maple Creek, Tulare Co., *W. Fry* 388. Coastal S. Cal.: Sycamore Cañon, Santa Inez Mts., *Jepson* 9132; San Gabriel Cañon, San Gabriel Mts., *C. E. Hutchinson;* Henniger Flats, San Gabriel Mts., *Peirson* 128; Cajon Cañon, *Munz* 11,054; Jurupa Hills, Riverside, *C. M. Wilder* 91; Glen Ivy trail to Santiago Peak, Santa Ana Mts., *Munz* 7064; San Diego, *Mary Spencer* 109.

Refs.—OENOTHERA MICRANTHA Hornem. Hort. Hafn. Supplem. (1819), type from Cal.; Spr. Syst. Veg. 2:228 (1825); Jepson, Fl. W. Mid. Cal. 337 (1901), ed. 2, 283 (1911), Man. 684 (1925). *Sphaerostigma micranthum* Walp. Rep. 2:77 (1843). *Holostigma micranthum* Spach, Nouv. Ann. Mus. Par. 4:335 (1835). *O. hirta* Link, Enum. 1:378 (1821), type from Cal.; not O. hirta L. (1760). *Sphaerostigma hirtum* F. & M. Ind. Sem. Hort. Petrop. 2:22 (1835). Var. IGNOTA Jepson, Man. 684 (1925), type loc. Jurupa Hills, Riverside, *Wilder* 90. *O. hirta* var. *ignota* Munz, Bot. Gaz. 85:263 (1928). *Sphaerostigma bistortum* var. *reedii* Parish, Muhl. 3:60 (1907), type loc. San Bernardino Mts., *Reed. O. micrantha* var. *reedii* Jepson, Man. 684 (1925). *O. cheiranthifolia* var. *reedii* Parish; Lévl. Monog. Onoth. 449 (1913), type loc. San Bernardino Mts., *Reed & Parish. O. hirta* var. *jonesii* f. *reedii* Munz, Bot. Gaz. 85:263 (1928). *Sphaerostigma hirtellum* var. *montanum* Dav. Muhl. 3:108 (1907). Var. EXFOLIATA Munz, Am. Jour. Bot. 19:778 (1932). *Sphaerostigma micranthum* var. *exfoliatum* Nels. Bot. Gaz. 40:59 (1905), type loc. Colorado Desert, *Orcutt. O. hirta* var. *exfoliata* Munz, Bot. Gaz. 85:264 (1928). *Sphaerostigma pallidum* Abrams, Bull. Torr. Club 32:539 (1905), type loc. Cabezon, *Abrams* 3228; not

O. pallida Lindl. Bot. Reg. t. 1142 (1828). *O. abramsii* Mcbr. Contrib. Gray Herb. 65:41 (1922). *O. micrantha* var. *abramsii* Jepson, Man. 684 (1925). Var. JONESII Munz, Am. Jour. Bot. 19:778 (1932). *O. hirta* var. *jonesii* Lévl. Monog. Onoth. 213 (1904), type loc. Amador Co., *Hansen* 543. *O. jonesii* Lévl. l.c. 237, pl. opp. 208 (1904), type loc. Santa Cruz, *Jones* 2231. *Sphaerostigma micranthum jonesii* Nels. Bot. Gaz. 40:59 (1905). *O. hirtella* Greene, Fl. Fr. 215 (1891), "hill country from Lake Co. and Solano Co. southward"; Jepson, Fl. W. Mid. Cal. 337 (1901), ed. 2, 283 (1911). *Sphaerostigma hirtellum* Small, Bull. Torr. Club 23:190 (1896). *S. arenicola* Nels. Bot. Gaz. 40:58 (1905), type loc. Monterey, *Elmer* 3192. *O. micrantha* var. *hirtella* Jepson, Man. 684 (1925). *O. autrani* Lévl. l.c. 211, pl. opp. 208 (1904), type loc. San Diego, *Palmer* 102.

14. **O. cheiranthifolia** Hornem. Dune Sun-cup. Stems decumbent or mostly prostrate, radiating from a central rosette crowning the taproot, 1½ to 2½ feet long, rigid and tough; leaf-blades thick, white-pubescent, obovate to oblong or oblong-oblanceolate, obtuse, ½ to 1 inch long, sessile or the lower petioled; calyx-tube 1 to 2 lines long; petals yellow, 3 to 8 lines long; capsules linear-oblong, stout, chartaceous, acutely quadrangular or almost fluted, 7 to 10 lines long, spirally once coiled, the attenuate apex mostly spreading.

Sandhills and sandy beaches along the coast: San Diego Co. to Humboldt Co. North to Oregon. Apr.-July.

Locs.—La Jolla, San Diego Co., *Newlon* 304; Newport, Orange Co., *Alice King;* Manhattan Beach, near Redondo, *Bettys;* Ventura, *Jepson* 12,647; Surf, Santa Barbara Co., *K. Brandegee;* Pecho, San Luis Obispo Co., *Condit;* Carmel Bay, *E. Ferguson* 279; Gigling sta., Monterey Co., *E. Ferguson* 266; San Pedro, San Mateo Co., *Elmer* 4942; San Francisco, *Jepson* 10,265; West Berkeley, *Davy* 395; Dillons Beach, Marin Co., *Congdon;* Stone Lagoon, Humboldt Co., *M. S. Baker* 183.

Var. **suffruticosa** Wats. Usually suffrutescent; leaves green or silvery, the blades of the upper usually round-ovate, cordate at the sessile base, denticulate; petals 6½ to 11 lines long.—Sandy beaches, dunes or shore cliffs: Southern California coast from Santa Barbara Co. to San Diego Co. Northern Lower California. Mar.-July (Jan.-Dec.).

Locs.—Carpinteria, Santa Barbara Co., *Hall* 3169; Hueneme, Ventura Co., *Davy;* Santa Monica, *Barber* 24; Encinitas, *Parish* 4434; Coronado, San Diego Co., *Jepson* 1601.

Var. **nitida** Munz. Wholly glabrous.—San Miguel Isl.; Seaside, Monterey, *K. Brandegee;* betw. Castroville and Monterey, *K. Brandegee.*

Refs.—OENOTHERA CHEIRANTHIFOLIA Hornem. Hort. Hafn. (1807), type loc. Cal., *Wormskiold*, incorrectly indicated as "Chile" acc. P. A. Munz; Spr. Syst. Veg. 2:228 (1825); Jepson, Fl. W. Mid. Cal. 337 (1901), ed. 2, 283 (1911). *Holostigma cheiranthifolia* Spach. Nouv. Ann. Mus. Par. ser. 3, 4:336 (1835). *Sphaerostigma cheiranthifolia* F. & M. Ind. Sem. Hort. Petrop. 2:50 (1835). *O. spiralis* Lehm.; Hook. Fl. Bor. Am. 1:213 (1834), type from "North-West coast of America", *Menzies;* Jepson, Man. 684, fig. 666 (1925). *Sphaerostigma spirale* F. & M. Ind. Sem. Hort. Petrop. 2:50 (1835). Var. SUFFRUTICOSA Wats. Proc. Am. Acad. 8:592, 606 (1873), Monterey, *Coulter* 153 (first cited loc. and coll.). *O. viridescens* Lehm.; Hook. Fl. Bor. Am. 1:214 (1834), type from "North-West coast of America", *Menzies. Sphaerostigma viridescens* Walp. Rep. 2:77 (1843). *S. spirale viridescens* Nels. Bot. Gaz. 40:60 (1905). *O. spiralis* f. *viridescens* Lévl. Monog. Onoth. 222 (1904). *O. spiralis* var. *viridescens* Jepson, Man. 684 (1925). *O. spiralis* f. *arcuata* Lévl. l.c. *O. spiralis* f. *clypeata* Lévl. l.c. *Sphaerostigma spirale clypeatum* Nels. Bot. Gaz. 40:60 (1905). Var. NITIDA Munz, Bot. Gaz. 85:269 (1928). *O. nitida* Greene, Pitt. 1:70 (1887), type loc. San Miguel Isl., *Greene. Sphaerostigma nitidum* Small, Bull. Torr. Club 23:190 (1896). *O. spiralis* var. *nitida* Jepson, Man. 684 (1925).

15. **O. bistorta** Nutt. California Sun-cup. (Fig. 260.) Stems several from the base, prostrate, ascending or erect, 2 or 3 inches to 2 feet long; herbage thinly pilose or puberulent; leaf-blades linear-oblanceolate or the upper lanceolate, irregularly or obscurely denticulate or subentire, 1 to 3½ inches long, the cauline sessile, or the lower ones narrowed to a petiole, the earliest leaves in a basal tuft; calyx-tube 1 to 2½ lines long; petals yellow, without a dark spot at base, commonly drying greenish, orbicular-obovate, 3 to 7 lines long; capsules filiform-linear, attenuate upward, sharply quadrangular, curved or arcuate, or spirally contorted, ¾ to 1¾ inches long.

Gravelly washes, sandy flats or valleys and open hillsides, 5 to 6700 feet: southern Sierra Nevada in Tulare and Kern Cos.; Tehachapi Mts.; San Luis Obispo Co.; cismontane Southern California; west side Colorado Desert. South to Lower California. Mar.-June.

Locs.—S. Sierra Nevada: Maple Creek, Sequoia Park, *W. Fry* 358; South Fork Kern River, *Purpus*. Tehachapi Mts.: Breckenridge Mt., *Bauer* 300. San Luis Obispo Co.: San Luis Obispo, *Condit*. Cismontane S. Cal.: Simi Valley, Ventura Co., *Jepson* 8457; Santa Monica Cañon, *Barber* 100; San Gabriel Cañon, San Gabriel Mts., *C. E. Hutchinson;* Henniger Flats, San Gabriel Mts., *Peirson* 129; Baldwin Lake, San Bernardino Mts., *Munz* 10,739; San Bernardino, *Jepson* 6091; Riverside, *Jepson* 1210; Vandeventer Flat, Santa Rosa Mts., *Jepson* 1422; Anaheim plains, *Alice King;* Ramona, *Jepson* 8521; Escondido, *Carl Meyer* 3; Mesa Grande, *E. Ferguson* 102; San Diego, *Dunn*. Colorado Desert (west side): Mason Valley, e. San Diego Co., *Jepson* 8717.

Var. **hallii** Jepson. Leaves pallid with short appressed hairs.—Conchilla Range (Piñon Well, n. of Indio, *Jepson* 6006); Conchilla Desert (Indio), (Bot. Gaz. 85:267); San Jacinto Mts. (Banning) and s. to Cuyamaca Mts. (Warners Hot Sprs.), (Bot. Gaz. 85:267).

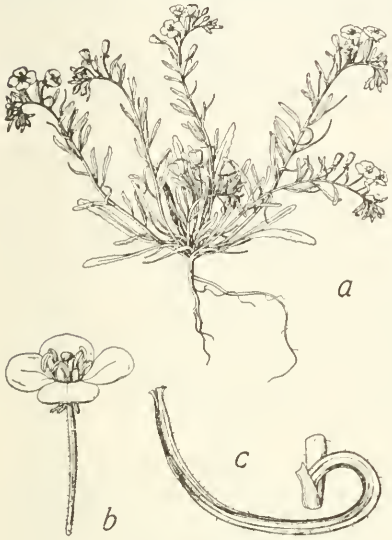


Fig. 260. OENOTHERA BISTORTA Nutt. *a*, habit, × 1/6; *b*, fl., × 1; *c*, capsule, × 1.

Refs.—OENOTHERA BISTORTA Nutt.; T. & G. Fl. 1:508 (1840), type loc. San Diego, *Nuttall;* Jepson, Man. 685 (1925). *Sphaerostigma bistortum* Walp. Rep. 2:77 (1843). *O. bistorta* var. *veitchiana* Hook. Bot. Mag. t. 5078 (1858), type loc. San Gabriel, *Lobb* 416. *Sphaerostigma veitchianum* Small, Bull. Torr. Club 23: 191 (1896). *S. bistortum veitchianum* Nels. Bot. Gaz. 40:59 (1905). *O. cheiranthifolia* f. *veitchiana* Lévl. Monog. Onoth. 217 (1904). *O. veitchiana* f. *delicatula* Lévl. l.c. 216 (1904). *O. contorta veitchiana* Lévl. l.c. 241 (1904). *O. spiralis* var. *linearis* Jepson, Man. 684 (1925), type loc. Sunnyside, San Diego Co., *Hall* 3908. Var. HALLII Jepson, Man. 685 (1925). *Sphaerostigma hallii* Dav. Muhl. 3:107 (1907), type loc. Banning, Riverside Co., *Hall* 446.

16. **O. dentata** Cav. MOHAVE SUN-CUP. Stems diffusely branched from the base, 3 to 9 inches high; herbage glabrous or puberulent; leaf-blades linear, mostly tapering to both ends, denticulate, 1/4 to 1 3/4 inches long, often with smaller leaves fascicled in the axils; calyx-tube 1 to 2 lines long; petals yellow, changing to dull red, round-obovate, 2 to 3 lines long; anthers versatile; capsules filiform-linear, arcuate-recurved, 7 to 12 lines long.

Sandy hill slopes, plains, washes and mesas, 500 to 6700 feet: coastal Southern California; Mohave Desert; upper San Joaquin Valley (Tulare and Kern Cos.). Chile. Apr.-June.

Locs.—S. Cal.: San Jacinto, *Jepson* 1251; San Bernardino, *Parish;* Little Rock Creek, San Gabriel Mts., *Peirson* 793; Warrens Well, San Bernardino Co., *T. Brandegee;* Kramer, Mohave Desert, *Jepson* 5320; Barstow, *Jepson* 5420; Mt. Pinos, Ventura Co., *C. L. Hitchcock* 75. Upper San Joaquin Valley: Rose sta., Kern Co., *Jepson* 12,421; Caliente, Kern Co., *Jepson* 6761; Terra Bella, Tulare Co. (Bot. Gaz. 85:260).

Var. **campestris** Jepson. Stems short-villous at least below; petals 2 1/2 to 4 lines long; capsules beaked.—Sandy slopes and valleys, 20 to 5000 feet: Coast Ranges from San Luis Obispo Co. to Lake Co.; Great Valley; Sierra Nevada foothills from Kern Co. to Butte Co. Also in Chile acc. Léveillé.

Locs.—Coast Ranges: Santa Margarita, *Summers;* Cholame Creek (upper), se. Monterey Co., *Jepson* 15,903; Santa Cruz Mts., *Pendleton* 945; Lakeport, Lake Co., *C. F. Baker* 3067. San Joaquin Valley: Delano, Kern Co., *Bettys;* Tipton, Tulare Co., *Jepson* 11,592; Delhi, Merced Co., *Jepson* 10,742; betw. Mossdale school and Atlanta, San Joaquin Co., *Jepson* 14,488; Brentwood, *Linda Gehringer*. Sierra Nevada: Greenhorn Range, Kern Co., *Hall & Babcock* 5037; betw. Pinehurst and Badger, Fresno Co., *Newlon* 175; Yosemite, *Wright & Patchett;* Knights Ferry, Stanislaus Co., *F. W. Bancroft;* Oroville, *Heller* 11,330.

Var. **cruciata** Wats.—Petals narrowly obovate to oblong, often emarginate, 2 to 3 lines long. —Sacramento Valley: Oroville (Bot. Gaz. 85:257).

Var. **johnstonii** Munz. Stems glabrate or glandular-pubescent; petals 5 to 7 lines long; capsules not beaked.—Sandy washes, 3000 to 4000 feet: Mohave Desert; upper San Joaquin Valley in Kern Co.; Inyo Co. East to Nevada.

Locs.—Mohave Desert and bordering mountains: Elizabeth Lake, Los Angeles Co., *Hall* 3066; Lancaster, *Epling, Ellison & Anderson;* Hinkley, Mohave Desert (Bot. Gaz. 85:259);

Mohave sta., *Heller* 7762; Tehachapi, *T. Brandegee.* Upper San Joaquin Valley: Oil City, Kern Co., *Heller* 7590. Inyo Co.: Bradbury Well, *Munz & Hitchcock* 10,998; Grape Vine Spr., *S. W. Austin* 539; Great Falls Cañon, Argus Mts., *Wheeler & Richardson.*

Refs.—OENOTHERA DENTATA Cav. Icon. Pl. 4:67, t. 398 (1797), type loc. "Coquimbo et Talcaguano, urbes Chilensis"; Lindley, Coll. Bot. t. 10 (1821); Jepson, Fl. W. Mid. Cal. 337 (1901), ed. 2, 283 (1911), Man. 685 (1925). *Sphaerostigma dentatum* Walp. Rep. 2:78 (1843). *O. torulosa* race *helianthemiflora* f. *mixta* Lévl. Monog. Onoth. 180 (1904) and f. *permixta* Lévl. l.c., type loc. Fresno. *Sphaerostigma campestre* var. *mixtum* Nels. Bot. Gaz. 40:57 (1905). *S. campestre parishii* Abrams, Fl. Los Ang. 272 (1904), type loc. plains about San Bernardino, *Parish.* *O. dentata* var. *parishii* Munz, Bot. Gaz. 85:259 (1928). Var. CAMPESTRIS Jepson, Man. 685 (1925). *O. campestris* Greene, Fl. Fr. 216 (1891), type Californian. *Sphaerostigma campestre* Small, Bull. Torr. Club 23:189 (1896). Var. CRUCIATA Wats. Proc. Am. Acad. 8:594, 606 (1873), type *Hartweg* 1733 (Sacramento Valley, cf. Benth. Pl. Hartw. 310); Jepson, Fl. W. Mid. Cal. 338 (1901), ed. 2, 284 (1911), Man. 685 (1925). *O. campestris* var. *cruciata* Greene, Fl. Fr. 216 (1891). *O. torulosa* race *helianthemiflora* f. *cruciata* Lévl. Monog. Onoth. 180 (1904). *Sphaerostigma campestre minor* Small, Bull. Torr. Club 23:189 (1896). Var. JOHNSTONII Munz, Bot. Gaz. 85:259 (1928), type loc. Mohave, *Johnston.*

17. **O. contorta** Dougl. Stems slender, 1 to several from the base, at first strict, at length diffusely branched, 4 to 16 inches high; herbage glabrous or minutely pubescent; leaf-blades linear, remotely low-denticulate, ½ to 1¼ inches long; calyx-tube ½ to ¾ line long; petals 1 to 1½ lines long, yellow, aging to deep red; anthers innate; capsules narrow-linear, straight and ascending, or with the lower part curved and the upper part ascending, ¾ to 1¾ inches long, ¼ line wide.

Mostly dry or sandy ground, valley plains, hillslopes and desert mesas, 20 to 7000 feet: almost throughout cismontane California; east of the Sierra Nevada from Modoc Co. to Inyo Co.; rare in the Mohave Desert; not reported from the Colorado Desert. North to British Columbia, east to Wyoming, south to Lower California. Chile. Apr.-June.

Locs.—S. Cal.: Descanso, San Diego Co., *Munz & Harwood* 7137; Saunder's Mdw., San Jacinto Mts., *Carl Meyer* 159; Anaheim plains, *Alice King;* San Bernardino, *Jepson* 5555; Baldwin Lake, San Bernardino Mts., *Munz* 10,745; Arrastre Cañon, San Gabriel Mts., *Peirson* 405; Bicknell sta., n. Santa Barbara Co., *Jepson* 12,665. Coast Ranges: Cholame, se. San Luis Obispo Co., *Jepson* 16,186; San Miguelito Rancho near Jolon, *Jepson* 1637; Bear Valley, San Benito Co., *Jepson* 12,245; Monterey, *Woodcock;* Glen Echo, Santa Cruz Co., *Jepson* 14,476; Mt. Hamilton, *Elmer* 4625; Alameda, *Jepson* 14,526; San Francisco, *Greene;* Howell Mt., Napa Range, *Jepson* 14,478; Potter Valley, Mendocino Co., *Nettie Purpus;* Navarro, Mendocino Co., *Edith Byxbee;* Bucksport, Humboldt Co., *Tracy* 2191; Oro Fino, Siskiyou Co., *Butler* 615. Sierra Nevada: Kernville, Kern Co., *T. Brandegee;* Sparkville, Fresno Co., *Jepson* 15,135; Mono Hot Sprs., Fresno Co., *E. Ferguson* 430; Yosemite Valley, *Jepson* 10,478; Cosumne River, *V. Rattan* 6419; Phoenix Lake, Tuolumne Co., *A. L. Grant* 946; Big Valley, Modoc Co., *Baker & Nutting.* Great Valley: Selma, *H. P. Kelley;* Tracy, *C. F. Baker* 2775; South Peak, Marysville Buttes, *Jepson* 14,477; College City, *Alice King.* Mohave Desert: Kramer, *K. Brandegee.* Inyo to Modoc Co.: Argus Mts., *Hall & Chandler* 7089; Bishop, *Almeda Nordyke;* Sherwin grade, Mono Co., *Munz* 11,075; Chat, Long Valley, Lassen Co., *Davy;* Round Valley, Modoc Co., *L. S. Smith* 1197.

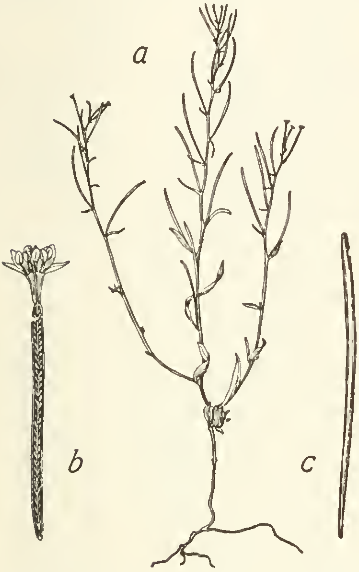
Var. **pubens** Cov. Plants grayish with a short dense hirsute pubescence.—Sandy soil, 4000 feet: east slope or easterly summits of the Sierra Nevada from Kern Co. (Erskine Creek, *Purpus* 5365) to Lassen Co. (Honey Lake, *T. Brandegee*). East to western Nevada. May-June.

Refs.—OENOTHERA CONTORTA Dougl.; Hook. Fl. Bor. Am. 1:214 (1833), type loc. "sandy barren soil on the interior banks of the Columbia River", *Douglas;* Jepson, Man. 685, fig. 667 (1925). *Sphaerostigma contortum* Walp. Rep. 2:78 (1843). *O. cheiranthifolia* var. *contorta* Lévl. Monog. Onoth. 216 (1904). *O. parvula* Nutt.; T. & G. Fl. 1:511 (1840), type loc. "plains of the Rocky Mts., toward Lewis's River", *Nuttall.* *Sphaerostigma parvulum* Walp. Rep. 2:78 (1843). *S. filiforme* Nels. Bot. Gaz. 40:57 (1905), type loc. New River, Utah. *S. strigulosum* F. & M. Ind. Sem. Hort. Petrop. 2:50 (1835). *O. strigulosa* T. & G. Fl. 1:512 (1840); Jepson, Fl. W. Mid. Cal. 337 (1901), ed. 2, 283 (1911). *O. contorta* var. *strigulosa* Munz, Bot. Gaz. 85:255 (1928). *O. strigulosa* var. *epilobioides* Greene, Fl. Fr. 216 (1891), type loc. "of the interior from Oregon to San Diego"; not O. epilobioides Nutt. (1840). *O. contorta* var. *epilobioides* Munz, Bot. Gaz. 85:256 (1928). *Sphaerostigma contortum greenei* Small, Bull. Torr. Club 23: 189 (1896). *O. torulosa* Lévl. Monog. Onoth. 176 (1904), type loc. San Bernardino Co., *Parry & Lemmon.* *Sphaerostigma contortum* var. *flexuosum* Nels. Bot. Gaz. 40:58 (1905), type loc. "Point of Rocks", *Nelson* 4060. *S. flexuosum* Rydb. Fl. Rocky Mts. 601 (1917). *O. contorta* var. *flexuosa* Munz, Bot. Gaz. 85:253 (1928). Var. PUBENS Cov. Contrib. U. S. Nat. Herb. 4:104 (1893); Jepson, Man. 685 (1925). *O. strigulosa* var. *pubens* Wats. Proc. Am. Acad. 8:594 (1873). *O. dentata* var. Wats. Bot. King 112 (1871), type from w. Nev., *Watson* 423. *Sphaero-*

stigma contortum pubens Small, Bull. Torr. Club 23:189 (1896). *S. pubens* Rydb. Bull. Torr. Club 33:146 (1906).

18. **O. andina** Nutt. Stems several from the base, diffuse or ascending, 1 to 4 inches long; herbage finely puberulent or glabrate; leaf-blades linear, 4 to 7 lines long, narrowed at base to a short petiole; flowers in the axils of the densely leafy branches; calyx-tube ½ to ¾ line long; petals yellow, ¾ to 1 line long; capsules linear, a little narrowed upward, straight or nearly so, 3 to 5 lines long.

Valleys and mountain slopes, 4000 to 6500 feet: Lassen and Modoc Cos. East to Utah and Wyoming, north to Washington. June-July.



Locs.—Shumway, Lassen Co., *Austin & Bruce* 2364; Big Valley, Modoc Co., *M. S. Baker;* Mt. Bidwell, Modoc Co., *Manning* 384.

Refs.—OENOTHERA ANDINA Nutt.; T. & G. Fl. 1:512 (1840), type loc. "dry plains in the Rocky Mts., near the Black-foot River", *Nuttall;* Jepson, Man. 685 (1925). *Sphaerostigma andinum* Walp. Rep. 2:79 (1843). *Oenothera andina* f. *tripetala* Lévl. Monog. Onoth. 182 (1904), type loc. not stated.

19. **O. chamaenerioides** Gray. (Fig. 261.) Stems slender, 1 to several from the base, simple or branched, erect or ascending, 6 to 11 inches high; herbage glabrous or nearly so; leaf-blades linear-oblong to oblong-ovate, entire or remotely denticulate, ½ to 1¼ inches long; flowers commonly few in very loose spikes, the spikes usually nodding; calyx-tube 1 line long; petals white or pinkish, ½ to 1 line long; capsules filiform-linear, straight, ascending or even strict, 1¼ to 2 inches long.

Sandy washes and mesas and dry mountain slopes, 1400 to 7400 feet: Inyo Co.; Mohave and Colorado deserts to San Diego Co. East to Texas, south to Lower California. Apr.-May.

Fig. 261. OENOTHERA CHAMAENERIOIDES Gray. *a*, habit, × ⅓; *b*, long. sect. of fl., × 2; *c*, capsule, × 1.

Locs.—Black Cañon, White Mts., *Duran* 2672; Pleasant Cañon, Panamint Range, *Hall & Chandler* 6964; Daggett, Mohave Desert, *K. Brandegee;* Corn Sprs., Chuckwalla Mts., *Munz & Keck* 4853; Yaqui Well (Ironwood Spr.), Colorado Desert, *T. Brandegee;* San Felipe, e. San Diego Co., *T. Brandegee;* Vallecito, e. San Diego Co., *Jepson* 8560.

Refs.—OENOTHERA CHAMAENERIOIDES Gray, Pl. Wright. 2:58 (1853), type loc. "stony hills along the Rio Grande near El Paso", *Wright;* Jepson, Man. 685 (1925). *Sphaerostigma chamaenerioides* Small, Bull. Torr. Club 23:189 (1896). *O. deserti* Jones, Contrib. West. Bot. 12:15 (1908), type loc. Needles, *Jones. Sphaerostigma deserti* Hel. Muhl. 9:68 (1913). *S. erythrum* Dav. Bull. S. Cal. Acad. 1:118, pl. 9 (1902), type loc. rocky slope of the San Francisco River, Clifton, Ariz., *A. Davidson. O. erythra* Mcbr. Contrib. Gray Herb. 65:41 (1922).

20. **O. alyssoides** H. & A. Stems several from the base, stout, spreading, or often one, simple and erect, 4 to 21 inches high; herbage glabrous or sparingly puberulent; bark exfoliating in broad strips, white and shining; leaf-blades narrow-ovate or lanceolate to narrow-obovate or oblanceolate, denticulate or entire, ½ to 4 inches long, attenuate into a very short petiole or the basal with petioles ¼ to as long; flowers in spikes, the spikes densely many-flowered, nodding or coiled at tip, or erect; calyx-tube tubular but a little widened upward, reddish, 1½ to 2¼ lines long; calyx reddish; petals white, fading pink, obovate to round-ovate, very shortly clawed, 1½ lines long; capsules strongly ridged on the angles and thus quandrangular, or sometimes terete, little attenuate upward, recurved-contorted, 5 to 8 lines long, crowded on the axis.

Sandy soil, 4000 to 5800 feet: east side of Sierra Nevada from Inyo Co. to Modoc Co. North to Canada, east to the Rocky Mts. June-July.

Locs.—Bishop, Inyo Co., *K. Brandegee;* Westgard Pass, Inyo Co., *Keck* 530; Silver Cañon, White Mts., *K. Brandegee;* Black Cañon, White Mts., *Duran* 2694; Shumway, Lassen Co., *C. C. Bruce* 2139.

Var. **villosa** Wats. Leaves grayish-villous to thinly hirsute or villous, often glabrate, the stems very thinly hirsute usually; capsules 3 to 5½ lines long.—Washes or in low chaparral, 5000 to 7500 feet: Mono Co. North to eastern Washington, east to Nevada.

Locs.—White Mts., *Purpus* 6425; Benton, *Shockley* 113; Mono Lake, *Chesnut & Drew;* Mono Craters, *Peirson.*

Var. **decorticans** Jepson. Herbage usually glabrous or glabrate, the inflorescence sometimes a little glandular; spikes mostly nodding; capsules spreading or downcurved, little indurated, ½ to 1½ lines thick at base.—Washes, dry plains and mountain slopes, 500 to 7400 feet: San Gabriel Mts. (desert slope) and north to the mountains of Santa Barbara Co.; Colorado Desert; Mohave Desert: South Coast Ranges; upper San Joaquin Valley in Kern Co.; Greenhorn Range; Inyo Co. East to Utah and Arizona. Mar.-June.

Locs.—Colorado Desert: Calexico, *Davy* 7993; Coyote Wells, sw. Imperial Co., *Newlon* 389; Vallecito, e. San Diego Co., *Jepson* 8556; San Felipe Narrows, *Carl Meyer* 30; Whitewater, *Parish.* Coastal S. Cal.: Rock Creek, San Gabriel Mts., *Peirson* 479; Santa Paula, *Benj. Cobb* 156; Mono Flat ranger sta., Santa Barbara Co., *A. L. Grant* 1689. Mohave Desert: Warrens Well, *Jepson* 5972; New York Mts., *J. Grinnell;* Calico Wash, ne. of Barstow, *Jepson* 5359; Hawes sta., *Jepson* 15,554; Amargo sta., *Jepson* 15,775. South Coast Ranges: Elkhorn Scarp, Temblor Range, se. San Luis Obispo Co., *Jepson* 16,230; Zapato Chino Creek, sw. Fresno Co., *Jepson* 15,387; San Carlos Creek, San Carlos Range, *Jepson* 2729; Bitterwater Valley, San Benito Co., *Jepson* 12,044; Paso Robles, *Betty Knight;* Jolon, Monterey Co., *Brewer* 579; Corral Hollow, e. Alameda Co., *Brewer* 1218. Upper San Joaquin Valley: Sivert sta., Kern Co., *Jepson* 11,609. Inyo Co.: Cottonwood Creek, Owens Lake, *Jepson* 5092; Hanaupah Cañon, Panamint Range, *Jepson* 6976.

Refs.—OENOTHERA ALYSSOIDES H. & A. Bot. Beech. 340 (1838), type loc. Pine Creek, Snake country, *Tolmie;* Jepson, Man. 686 (1925). *Sphaerostigma alyssoides* Walp. Rep. 2:78 (1843). *O. gauraeflora* var. *alyssoides* Lévl. Monog. Onoth. 241 (1904). *Sphaerostigma tortuosum* Nels. Proc. Biol. Soc. Wash. 17:95 (1904), type loc. Truckee Pass, Virginia Mts., Washoe Co., Nev., *Kennedy.* *O. gauraeflora* var. *vermiculata* Jones, Contrib. W. Bot. 12:16 (1908), type loc. Reno, Nev., *Jones.* Var. VILLOSA Wats. Proc. Am. Acad. 8:591 (1873), type from Nev. *Sphaerostigma alyssoides* var. *macrophyllum* Small, Bull. Torr. Club 23:192 (1896). *S. utahense* Small, Bull. Torr. Club 23:191 (1896), type loc. Great Salt Lake, *Stansbury.* *S. lemmonii* Nels. Bot. Gaz. 40:61 (1905), type loc. "eastern flank of the Sierra Nevada", *Lemmon.* Var. DECORTICANS Jepson, Man. 686, fig. 668 (1925). *Gaura decorticans* H. & A. Bot. Beech. 343 (1838), type from Cal., *Douglas.* *O. decorticans* Greene, Fl. Fr. 217 (1891). *Sphaerostigma decorticans* Small, Bull. Torr. Club 23:191 (1896). *O. gauraeflora* T. & G. Fl. 1:510 (1840), type from Cal., *Douglas.* *Sphaerostigma gauraeflorum* Walp. Rep. 2:78 (1843). *O. nevadensis* Kell. Proc. Cal. Acad. 2:224, pl. 70 (1863), type loc. probably in Nevada. *Sphaerostigma nevadense* Hel. Muhl. 6:51 (1910). *O. gauraeflora* var. *caputmedusae* Lévl. Monog. Onoth. 226 (1904), type from Cal., *Lemmon.* *O. rutila* Dav. Erythea 2:62 (1894), type loc. Rock Creek, San Gabriel Mts., *Davidson.* *Sphaerostigma rutilum* Parish, Erythea 6:89 (1898). *O. decorticans* var. *rutila* Munz, Bot. Gaz. 85:245 (1928). *O. decorticans* var. *desertorum* Munz, Bot. Gaz. 85:246 (1928), type loc. Garlic Sprs., ne. Mohave Desert, *Munz & Keck* 7881. *O. decorticans* var. *condensata* Munz, Bot. Gaz. 85:247 (1928), type loc. Dos Palmas Spr., Colorado Desert, *Munz* 9960.

21. **O. refracta** Wats. SPIDER OENOTHERA. (Fig. 262.) Stems 1 to several from the base, simple or mostly sparingly branched, ½ to 2½ feet high; herbage glabrous or slightly puberulent, sometimes a little glandular; leaves mostly basal or on lower part of plant, the blades linear-lanceolate to lanceolate, pinnatifid to irregularly dentate or denticulate, 1 to 6 inches long, the upper narrow-linear or filiform, and often subentire, the lower ones shortly petioled; flowers in spikes, the spikes somewhat nodding in bud; calyx-tube narrow-funnelform, 1½ to 2 lines long; petals pale yellow to white, 1½ to 2 lines long; capsules filiform-linear, cylindric, straight or somewhat curved or contorted, mostly sharply refracted, 1¼ to 2¾ inches long.

Desert washes, plains and dry slopes, 100 to 4500 feet: Colorado and Mohave deserts; north to Inyo Co. East to Nevada and Utah. Feb.-May.

Field note.—The stems in well-developed plants are coarse at base but very slenderly branched above. On account of the few branches and sparse foliage the plant structure is very skeleton-like. The stems are usually green, the branchlets, buds and leaves tending to be reddish.

Locs.—Colorado Desert: Coyote Wells, Imperial Co., *Jepson* 11,755; Vallecito, e. San Diego Co., *Jepson* 8591; Cottonwood Spr., n. of Mecca, *Jepson* 12,595; Chuckwalla Bench, *Schellenger.*

Mohave Desert: Daggett, *K. Brandegee;* Kane Springs wash, *Jepson* 15,528; Needles, *Jones* 3828. Inyo Co.: Bradbury Well, *Munz & Hitchcock* 11,000.

Refs.—Oenothera refracta Wats. Proc. Am. Acad. 17:373 (1882), type loc. "near the Colorado" (River), *Bigelow;* Jepson, Man. 686 (1925). *Sphaerostigma refractum* Small, Bull. Torr. Club 23:192 (1896).

22. **O. leptocarpa** Greene. Stem stout, simple or with few virgate ascending branches, 1½ to 3 feet high, the branches ending in few-flowered spikes; herbage glabrous; leaf-blades lanceolate in outline, unequally dentate or pinnatifid, 1 to 3 inches long, mostly short-petioled, the cauline leaves very sparse and the upper much reduced, those of the basal rosette disappearing early; calyx-tube almost none; sepals reflexed; stamens 8, those alternate the petals with oblong anthers, those opposite with smaller globose anthers; petals rhombic-ovate, light yellow, turning pink, 3 to 5 lines long; capsules linear, quadrangular, imperfectly 4-celled, strongly refracted, 2 to 3¾ inches long.

Dry sandy hill slopes, flats or washes, 500 to 3000 feet: San Luis Obispo Co. and the southern Sierra Nevada in Kern Co. south to San Diego Co. and the Colorado Desert. East to Arizona, south to Lower California. Mar.-June.

Locs.—San Luis Obispo Co.: San Luis Obispo, *Condit.* Coastal S. Cal.: Santa Barbara, *Munz* 9323; Arroyo Seco, San Gabriel Mts., *Peirson* 349; San Bernardino Valley, *Jepson* 5545; Riverside, *Jepson* 1215; Viejas Valley, *K. Brandegee;* Dahesa, near San Diego, *Mary Spencer* 60. Sierra Nevada in Kern Co.: lower Kern River Cañon (Am. Jour. Bot. 16:256). Mohave Desert: Providence Mts. (Am. Jour. Bot. 16:256). Colorado Desert: Shavers Well, *Hall* 6242; Palm Sprs. of San Jacinto, *Schellenger;* San Felipe Narrows, *C. V. Meyer* 27; Mountain Sprs. (grade e. of), e. San Diego Co., *Newlon* 384.

Refs.—Oenothera leptocarpa Greene, Pitt. 1:302 (1889). *Eulobus californicus* Nutt.; T. & G. Fl. 1:515 (1840), type loc. San Diego, *Nuttall;* Jepson, Man. 687 (1925). *O. californica* Greene, Pitt. 1:290 (1889); not O. californica Wats. (1876). *O. eulobus* Lévl. Monog. Onoth. 231 (1904). *O. crassifolia* var. *leptocarpa* Lévl. l.c. 209 (1904).

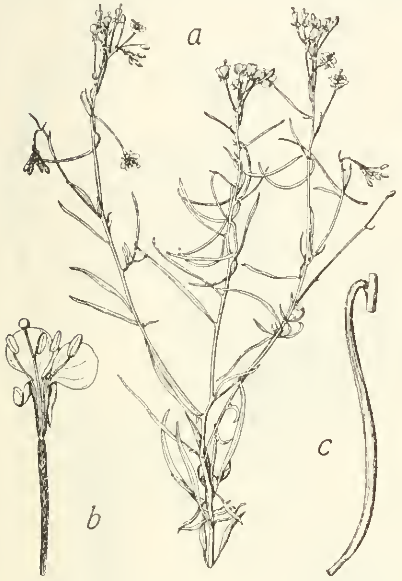


Fig. 262. Oenothera refracta Wats. *a,* upper part of plant, × ⅓; *b,* long. sect. of fl., × 1½; *c,* deflexed capsule, × 1.

23. **O. pterosperma** Wats. Stems slender, erect and simple or branched from the base, 2 to 5 inches high; herbage more or less short-hispidulose; leaves mostly cauline, the blades oblong-lanceolate to ovate-lanceolate, entire, short-petioled or sessile, 2½ to 10 lines long; flowers axillary; pedicels capillary, 2½ to 4 lines long; calyx-tube about 1 line long; petals pinkish-white, obcordate, ¾ to 1¼ lines long, equaling the sepals; capsules cylindric-clavate, slightly curved, 5 to 8 lines long; seeds flattened, oblong, ¾ line long, with revolute minutely tuberculate wing-like margin.

Foothills, 4200 feet: Inyo Co. North to Oregon, east to Nevada and Utah. May-June.

Loc.—West of Bishop (Am. Jour. Bot. 15:226).

Refs.—Oenothera pterosperma Wats. Bot. King 112, pl. 14, figs. 4–7 (1871), type loc. Trinity Mts., nw. Nev., *Watson* 424. *Chylismia pterosperma* Small, Bull. Torr. Club 23:193 (1896). *Sphaerostigma pterospermum* Nels. Bot. Gaz. 40:63 (1905).

24. **O. kernensis** Munz. Kern Sun-cup. (Fig. 263.) Stem simple and erect, or with few ascending branches above the base, rather equably and somewhat

closely leafy, 3 to 6 inches high; herbage gray with short spreading hairs; leaf-blades linear to lanceolate or oblanceolate, denticulate to subentire, 3 to 8 lines long, sessile or subsessile; calyx-tube 1 line long; petals yellow, aging umber, with 2 brown or reddish spots near the base, 5 to 7 lines long; capsules narrowly cylindric-clavate, 10 to 12 lines long; pedicels 2 to 3 lines long.

Sandy flats, 4500 feet: Walker Pass, southern Sierra Nevada. May.

Ref.—OENOTHERA KERNENSIS Munz, Am. Jour. Bot. 18:737 (1931), type loc. Freeman Cañon, below Walker Pass, Kern Co., *Peirson* 8822.

25. **O. cardiophylla** Torr. (Fig. 264.) Stem erect, freely branching, 1 to 2½ feet high, mostly leafy on lower part; herbage villous-pubescent, or the leaves subglabrate; leaf-blades round-ovate, cordate at base, dentate or denticulate, ½ to 2¼ inches long, on petioles ¾ to 2½ inches long; flowers in dense terminal spikes, the spikes nodding at apex; calyx-tube 3 to 4 lines long; petals yellow, aging a lively brick red, 3 lines long; capsules strictly erect or ascending, linear, 1 to 1¾ inches long.

Desert cañons and gullies, 10 to 2000 feet: Inyo Co.; eastern Mohave Desert; Colorado Desert. East to Arizona, south to Lower California. Sometimes perennial acc. J. A. Ewan. Mar.-May.

Locs.—Inyo Co.: Nelson Range, *S. W. Austin;* Surprise Cañon, Panamint Range, *Jepson* 7135; Hanaupah Cañon, Panamint Range, *Jepson* 7110. Mohave Desert: Newberry Spr., *Lemmon.* Colorado Desert: Cottonwood Spr., Cottonwood Mts., *Jepson* 12,613; Palm Sprs. of San Jacinto, *Parish* 4118; Indio Mt., *Hall* 5822; Borrego Sprs., San Diego Co., *K. Brandegee;* Calexico, *Davy* 8003; Carrizo Cañon, Imperial Co., *Parks.*

Var. **splendens** Munz & Jtn. Calyx-tube 9 to 17 lines long; petals 6 to 7 lines long.—Along the lower Colorado River and west to the Salton Sink: Needles; Chocolate Mts., *L. J. Childs;* Oasis, Salton Sink (Am. Jour. Bot. 15:227); Beal Well, ne. of Niland, *I. T. Weeks.* The following is intermediate towards the species: Corn Sprs., Chuckwalla Mts., *Munz & Keck* 4785. Dec.-Apr.

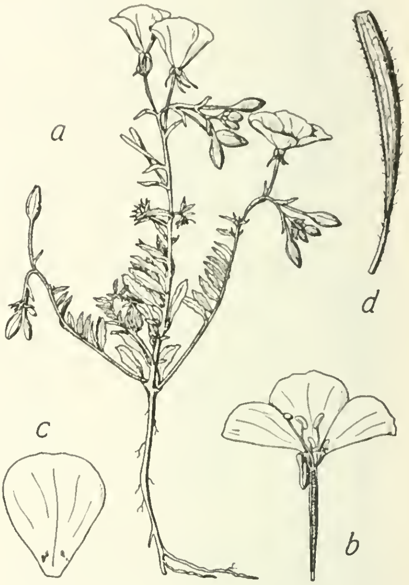


Fig. 263. OENOTHERA KERNENSIS Munz. *a*, habit, × ½; *b*, long. sect. of fl., × 1; *c*, petal, × 2¼; *d*, capsule, × 1½.

Refs.—OENOTHERA CARDIOPHYLLA Torr. Pac. R. Rep. 5:360 (1856), type loc. near Fort Yuma, probably in Cal., *Thomas & DuBarry;* Jepson, Man. 686 (1925). *Chylismia cardiophylla* Small, Bull. Torr. Club 23:193 (1896). Var. SPLENDENS Munz & Jtn. Bull. Torr. Club 49:354 (1922), type loc. Needles, *Grinnell.* *O. cardiophylla* var. *longituba* Jepson, Man. 686 (1925), type loc. Needles, *Grinnell.*

26. **O. scapoidea** T. & G. Stems several from the base, erect or ascending, 6 to 14 inches high, with mostly basal leaves; herbage glabrous or nearly so; leaf-blades lyrately pinnatifid, with large terminal ovate to oblong-lanceolate leaflet or segment, and few or several small lateral ones, all denticulate or dentately lobed, purple-veined, ½ to 6 inches long, on petioles ½ to nearly as long; flowers in a dense terminal spike coiled at tip, the inflorescence flowering unilaterally; calyx-tube 1 to 2 lines long; petals white (rarely yellow), 2 to 3 lines long; stigma greenish; capsules linear-oblong, quadrangular, midnerve of the valves rounded, ridge-like, 4 to 10 lines long, on pedicels 2 to 7 (or 9) lines long.

Sandy desert mesas, stony slopes and plains, –100 to 3000 feet: Colorado and Mohave deserts and north along east side of the Sierra Nevada to Lassen Co. North to Oregon, east to Wyoming and Arizona, south to Lower California. Dec.-Apr.

Field note.—The leaves are quite variable as to degree of segmentation and size of segments. The eight anthers approximate around style and are stellately radiant from it just below the greenish stigma. The petals are broader than long, truncatish at base and shortly clawed. The calyx-tube is thick and fleshy, orange-color inside, pubescent towards base. The lower third of style is pubescent.

Locs.—Colorado Desert: Vallecito, *Jepson* 8593; San Felipe Wash, *Jepson* 8903; Borrego Spr., ne. San Diego Co., *Jepson* 8884; Indio, *L. E. Carpenter;* Cottonwood Spr., n. of Mecca, *Jepson* 12,610. Mohave Desert: Helendale, *Newlon* 480; Ord Mt., *Jepson* 5867; Calico Wash, n. of Daggett, *Jepson* 5417; Lavic, *Jepson* 15,470. Sierra Nevada, east of: Furnace Creek, Funeral Mts., *Jepson* 6914; Laws, Inyo Co., *Heller* 8231; Rock Creek, n. of Sherwin grade, Mono Co., *Munz* 11,071; Truckee River cañon, *K. Brandegee;* Amedee, Honey Lake Valley, *Davy* 3399.

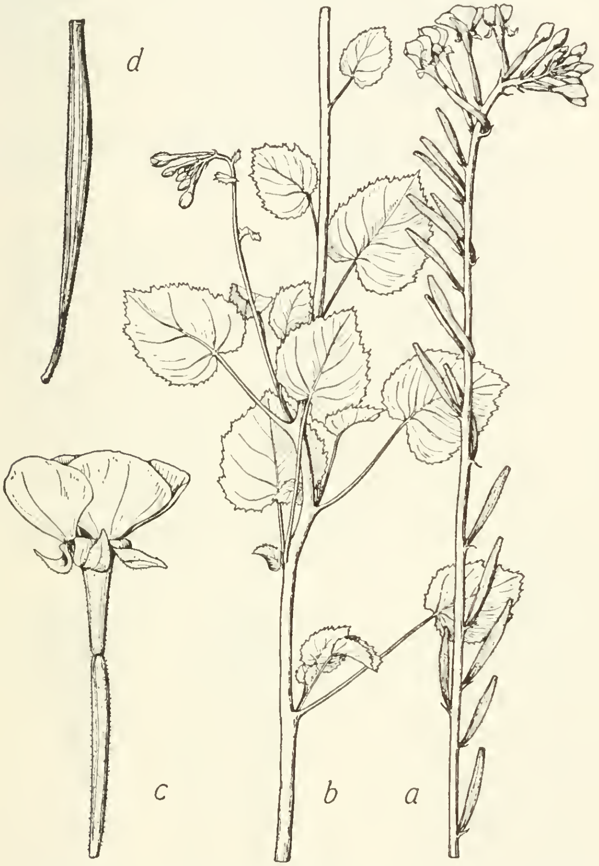


Fig. 264. OENOTHERA CARDIOPHYLLA Torr. *a*, upper part of plant, × ⅓; *b*, lower part of plant, × ⅓; *c*, fl., × 1¼; *d*, capsule, × 1.

Var. **aurantiaca** Wats. Petals bright rose-color or orange; capsule often puberulent.—Sandy washes, -100 to 2000 feet: Inyo Co.; Mohave and Colorado deserts. East to Utah and Arizona, south to Lower California. Mar.-May.

Locs. — Stovepipe Wells, Death Valley, *Munz & Hitchcock* 11,030; Kramer, Mohave Desert, *Jepson* 5353; Needles, *Jones* 3793; Palm Sprs. of San Jacinto, *Parish* 4116; Silent Cañon, Santa Rosa Mts. (se. end), *Jepson* 11,706; Coyote Wells, sw. Imperial Co., *Jepson* 11,753; Mountain Sprs. (e. of), Imperial Co., *Newlon* 374.

Var. **purpurascens** Wats. Petals white, changing to pinkish (or drying purplish).—Inyo Co.; Mohave and Colorado deserts.

Locs.—Argus Mts., Inyo Co., *Purpus* 5030; Barstow, Mohave Desert, *K. Brandegee;* Adelanto, w. Mohave Desert, *Craig & Simonds* 1011; Indian Wells, Colorado Desert, *Munz & Keck* 4994.

Refs. — OENOTHERA SCAPOIDEA T. & G. Fl. 1:506 (1840), type loc. "clay hills in the Rocky Mts.," *Nuttall;* Jepson, Man. 686 (1925). *Chylismia scapoidea* Small, Bull. Torr. Club 23:193 (1896). *O. brevipes* var. *scapoidea* Lévl. Monog. Onoth. 146 (1904). Var. AURANTIACA Wats. Proc. Am. Acad. 8:595 (1873), type from Cal., *Coulter;* Jepson, Man. 687 (1925). *Chylismia scapoidea* var. *aurantiaca* Dav. & Mox. (erroneously "Wats."), Fl. S. Cal. 254 (1923). *O. clavaeformis* Torr. & Frem.; Frem. Rep. 314 (1845), "doubtless . . . Cal.," *Fremont. O. scapoidea* var. *clavaeformis* Wats. Bot. King 109 (1871). *O. clavaeformis* var. *aurantiaca* Munz, Am. Jour. Bot. 15:237 (1928). *O. clavaeformis* var. *peirsonii* Munz, Am. Jour. Bot. 15:238 (1928), type loc. 28 mi. e. of Coachella, *Peirson* 4512. *Chylismia scapoidea clavaeformis* Small, Bull. Torr. Club 23:194 (1896). *C. clavaeformis* Hel. Muhl. 2:105 (1906). Var. PURPURASCENS Wats. Proc. Am. Acad. 8:595 (1873), "eastern side of the Sierra from Oregon to Mono Lake"; l.c. 613, *Brewer* 1845 [Mono Lake], the spm. first cited; Jepson, Man. 687 (1925). *Chylismia lancifolia* Hel. Muhl. 2:226 (1906), type loc. near Laws, Inyo Co., *Heller* 8231. *O. cruciformis* Kell. Proc. Cal. Acad. 2:227, pl. 71 (1863), type loc. Steamboat Sprs., Nev. *Chylismia cruciformis* Howell, Fl. Nw. Am. 233 (1898). *O. clavaeformis* var. *cruciformis* Munz, Am. Jour. Bot. 15:235 (1928).

27. **O. brevipes** Gray. Similar to no. 26; stems coarser, 4 to 22 inches high; herbage on lower parts villous; leaf-blades ovate to lanceolate, subentire or denticulate or lyrately pinnatifid with few or several small lateral lobes, 1 to 4 inches long, on petioles 1/4 to about as long; flowers in spikes, the spikes nodding in the bud; calyx-tube 1 to 2 lines long; petals golden-yellow, somewhat quadratish, truncatish or retuse, 2 to 8 lines long; capsules 1 to 2¾ inches long, spreading or refracted, the pedicels stout, commonly 1 to 3 (rarely to 8) lines long.

Desert washes, –100 to 7000 feet: Colorado and Mohave deserts; Inyo Co. East to Arizona and southern Nevada. Dec.-May.

Locs.—Colorado Desert: Niland, Imperial Co. (Am. Jour. Bot. 15:229); betw. Westmoreland and Indio, *Newlon* 418; Palm Sprs. of Mt. San Jacinto, *Gilman;* Cottonwood Sprs., n. of Mecca, *Jepson* 12,609; Dos Palmas Sprs., Riverside Co., *Munz* 9950; Corn Sprs., Chuckwalla Mts., *Munz & Keck* 4894. Mohave Desert: Calico Wash, ne. of Barstow, *Jepson* 4815; Ord Mt., *Jepson* 15,494; Newberry, *Newlon* 500; Yermo, *Jepson* 15,869. Inyo Co.: Hanaupah Cañon, Panamint Range, *Jepson* 6973.

Refs.—OENOTHERA BREVIPES Gray, Pac. R. Rep. 4:87 (1857), type loc. near the Colorado (River), *Bigelow;* Jepson, Man. 687, fig. 669 (1925). *Chylismia brevipes* Small, Bull. Torr. Club 23:194 (1896).

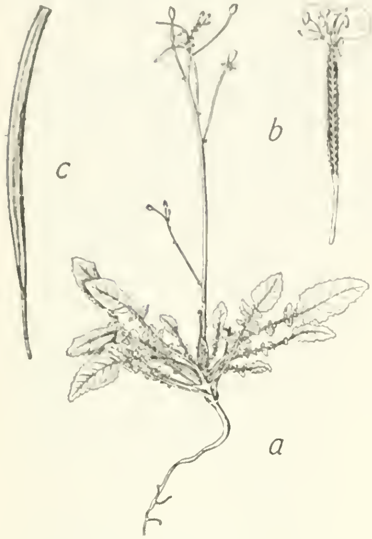


Fig. 265. OENOTHERA MULTIJUGA Wats. *a*, habit, × 1/3; *b*, long. sect. of fl., × 1; *c*, capsule, × 1½.

28. **O. multijuga** Wats. (Fig. 265.) Stems 1 or several from the base, nearly naked, widely branched or sometimes simple, 2/3 to 2 feet high; herbage thinly villous or subglabrous above; leaves irregularly pinnate, 2 to 5 (or 8) inches long, the leaflets very unequal, the terminal one usually several times the largest, all more or less petiolulate; sometimes the leaves partially bipinnate, divided into 10 to 16 unequal lobes; flowers in very loose racemes; pedicels nodding in the bud, capillary, in fruit 4 to 9 lines long; calyx often reddish; calyx-tube 1/2 to 1 line long; petals yellow, sometimes drying purplish, 1½ to 3 lines long; capsules linear, slender, 1/2 to 1 inch long; pedicels slender or capillary, 3 to 6 lines long.

Cañon floors and washes, 30 to 5700 feet: Inyo Co. East to Utah and Arizona. Annual or biennial. Apr.-May.

Locs.—Hole-in-Rock Spr., e. of Stovepipe Wells, Death Valley, *Munz & Hitchcock* 11,037; Furnace Creek, Death Valley, *Parish* 10,045; Wild Rose Cañon, Panamint Range, *Jepson* 7131; Inyo, *T. Brandegee;* Black Cañon, White Mts., *Duran* 2655.

Refs.—OENOTHERA MULTIJUGA Wats. Am. Nat. 7:300 (1873), type from n. Ariz., *E. P. Thompson;* Proc. Am. Acad. 8:595 (1873), "southern Utah". *Chylismia multijuga* Small, Bull. Torr. Club 23:193 (1896). *O. brevipes* var. *multijuga* Jepson, Man. 687 (1925). *O. brevipes* var. *parviflora* Wats.; Parry, Am. Nat. 9:271 (1875), type loc. "Valley of the Virgin (River) near St. George, Utah", *Parry* 74. *Chylismia parviflora* Rydb. Fl. Rocky Mts., 603, 1064

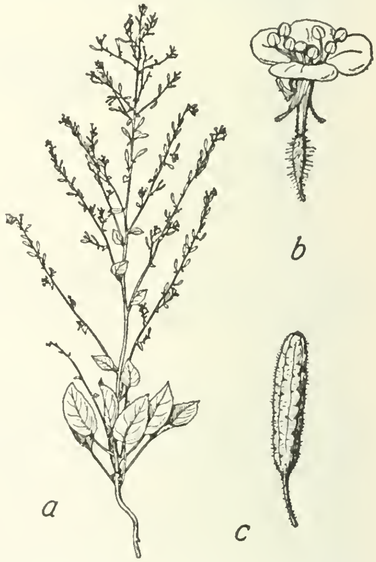


Fig. 266. OENOTHERA HETEROCHROMA Wats. *a*, habit, × 1/6; *b*, fl., × 2½; *c*, capsule, × 1½.

(1917). *O. multijuga* var. *parviflora* Munz, Am. Jour. Bot. 15:231 (1928). *O. scapoidea* var. *tortilis* Jepson, Man. 687 (1925), type loc. Wild Rose Cañon, Panamint Range, *Jepson* 7131.

29. **O. heterochroma** Wats. (Fig. 266.) Stems stout, 1¼ to 1¾ feet high, the branches slender or even filiform; leaves chiefly sub-basal but not in a rosette; leaf-blades elliptic to round-ovate, denticulate, sometimes subcordate at base, 1 to 2¾ inches long; petioles 1 line to 1½ inches long; flowers in a panicle with slender racemose branches; petals purplish, 1¼ to 2½ lines long; anthers about ⅔ as wide as long; capsules 6 lines long, 1 to 1¼ lines wide.

Dry valleys, 4000 to 6000 feet: Inyo Co. East to Nevada.

Locs.—Crooked Creek, Owens Valley (Am. Jour. Bot. 15:239). Nev.: Soda Springs Cañon, Mineral Co., *Shockley* 561.

Refs.—Oenothera heterochroma Wats. Proc. Am. Acad. 17:373 (1882), type loc. Candelaria, Nev., *Shockley* 19. *Chylismia heterochroma* Small, Bull. Torr. Club 23:193 (1896). *O. brevipes* race *parryi* Lévl. Monog. Onoth. 146 (1904) in part.

9. GAYOPHYTUM Juss.

Slender erect annual herbs. Leaves alternate, or the lower opposite. Flowers borne in leafy racemes. Calyx-tube none. Sepals 4. Petals 4. Stamens 8, the alternate 4 short. Ovary 2-celled; stigma capitate. Capsule 4-valved, pediceled. Seeds numerous, in a single row in each cell, naked.—Species 9, western North and South America. (C. Gay, author of the Flora Chileña, and Greek phyton, plant.)

Bibliog.—Trelease, W., Revision of the N. Am. species of Gayophytum (Rep. Mo. Bot. Gard. 5:107–116, pls. 17–22,—1894). Munz, P. A., The genus Gayophytum (Am. Jour. Bot. 19:768–778,—1932). Léveillé, H., Monographie du genre Onothera: groupe des Prismatiformes (Torulosae), 164–174 (1904).

Pedicels ¼ to as long as the capsules; branches with scattered leaves; capsules clavate or oblong, mostly torulose, obscurely if at all flattened; seeds erect or suberect.

Style a little dilated upwards, truncate at apex, the stigma discoid; seeds glabrous, smooth or minutely roughened.

Corolla 4 to 5 lines wide; petals white, aging pink..........1. *G. diffusum.*

Corolla 1½ to 2 lines wide; petals white, aging brick-red..........2. *G. ramosissimum.*

Style ending in a globose stigma; seeds covered with short sub-appressed hairs.

Herbage glabrous or nearly so; petals entire..........3. *G. lasiospermum.*

Herbage grayish-puberulent; petals erosulate..........4. *G. helleri.*

Pedicels almost none or very short; branches rather densely leafy; stigma capitate; seeds glabrous.

Capsules narrow-linear, more or less torulose; seeds erect or suberect..........5. *G. caesium.*

Capsules oblong, strongly flattened, not at all torulose; seeds obliquely ascending..6. *G. humile.*

1. **G. diffusum** T. & G. Stems profusely branched from or above the base, ½ to 2 feet high, glabrous or with scattered spreading hairs, more or less purplish; bark becoming papery and tending to exfoliate; leaf-blades linear or the lower linear-oblanceolate, glabrous or sparsely strigose, 5 to 8 lines long or the lower 1 to 2 inches long; flowers loosely disposed along the branchlets, strongly heliotropic; calyx-lobes ultimately reflexed in pairs; petals rhomboidal-ovate, white, turning pink or rose-color, 2 small yellow dots at base, (1½ or) 2 to 3 lines long; ovary canescent to glabrous; style a little dilated above the middle, truncate at apex, the stigma discoid; capsules at maturity more or less shrunken-constricted about the seeds and thus torulose, borne on filiform pedicels 1 to 3 lines long.

Dry open ridges or flats, 3800 to 8500 feet: Tehachapi Mts.; Sierra Nevada from Tulare Co. to Siskiyou Co.; Santa Lucia Mts.; Humboldt Co. East to Nevada, north to Washington and Wyoming. June-Aug.

Locs.—Tehachapi Mts.: Breckenridge Mt., *Bauer* 5. Sierra Nevada: South Fork Middle Tule River, *Jepson* 4875; Garfield Big Trees, Tulare Co., *Jepson* 4658; Round Mdw., Giant Forest, *Jepson* 685; Simpson Mdw., Middle Fork Kings River, *Henrietta Eliot;* Line Creek, Huntington Lake, *Jepson* 13,082; Yosemite, *Alice King;* Kennedy Mdws., Tuolumne Co., *A. L. Grant* 225; Dorrington, Calaveras Co., *Jepson* 10,049; Panther Creek, Amador Co., *Hansen;* Truckee, *H. M. Evans;* West Branch, Butte Co., *Cleveland;* Susanville, *Pearl Safford;* Goosenest foothills, e. Siskiyou Co., *Butler* 1630. Santa Lucia Mts.: Tassajara Road, Monterey Co., *Hall* 10,078. Humboldt Co., *Chesnut & Drew.*

Refs.—GAYOPHYTUM DIFFUSUM T. & G. Fl. 1:513 (1840), type loc. "Rocky Mts. and plains of Oregon", *Nuttall;* Trel. Rep. Mo. Bot. Gard. 5:110, pl. 19 (1894); Jepson, Fl. W. Mid. Cal. ed. 2, 284 (1901), Man. 688, fig. 670 (1925). *Oenothera gayophytum* race *treleasiana* f. *diffusa* Lévl. Monog. Onoth. 169 (1904). *G. diffusum* var. *villosum* Munz, Am. Jour. Bot. 19:773 (1932), type loc. Farewell Bend, Crook Co., Ore., *Leiberg* 435.

2. **G. ramosissimum** T. & G. Similar in habit to no. 1, ½ to 3½ feet high; herbage glabrous or puberulent; flower-buds mostly apiculate; flowers tardily or weakly heliotropic; calyx-lobes reflexed-spreading, all distinct; petals sub-orbicular, white, obscurely greenish-yellow at base, in age turning brick-red, ½ to 1 line long; ovary with short spreading hairs; pedicels about ¼ to as long as capsules.

Dry soil, mountain flats or slopes, 2500 to 9000 feet: Southern California mountains; Sierra Nevada from Tulare Co. to eastern Siskiyou Co.; North Coast Ranges from Lake Co. to western Siskiyou Co. North to Washington, east to South Dakota and New Mexico; Chile, Argentina. May-July.

Locs.—S. Cal.: Cuyamaca Lake, San Diego Co., *K. Brandegee;* Palomar Mt., *Esther Hewlett* 61; Tahquitz Valley, San Jacinto Mts., *Jepson* 2298; Mill Creek Cañon, San Bernardino Mts., *D. L. Crawford* 941; Arrowhead Lake, San Bernardino Mts., *Braunton* 1038; Vincent Gulch, San Gabriel Mts., *Peirson* 2483; Mt. Wilson, *Peirson* 130. Sierra Nevada: North Fork Middle Tule River, *Jepson* 4695; Big Cottonwood Mdw., w. Inyo Co., *Jepson* 930; Junction Camp, Kern Cañon, *Jepson* 1060; Marble Fork Kaweah River, *Jepson* 691; Lundy, Mono Co., *Minthorn* 28; Huntington Lake, Fresno Co., *Jepson* 12,965; Mono Ranger Mdw., Mono Creek, Fresno Co., *Jepson* 13,227; Yosemite Valley, *Jepson* 8360; Hetch-Hetchy, *Jepson* 3441; Leevining Creek, Mono Co., *Ottley* 1093; Deadman Creek, Middle Fork Stanislaus River, *Jepson* 6553; Silver Valley, Alpine Co., *Jepson* 10,100; Tahoe, *Jepson* 8077; Summit sta., Nevada Co., *Jepson* 14,440; Martin Sprs., Eagle Lake, *Brown & Wieslander* 2; Pine Creek, Lassen Co., *Baker & Nutting;* McCloud, Siskiyou Co., *Jepson* 5744. North Coast Ranges: Snow Mt., Lake Co., *Purpus* 1224; Soldier Ridge, Yollo Bolly Mts., *Jepson* 14,438; Grouse Mt., Humboldt Co., *Tracy* 4850; Devils Backbone, sw. Siskiyou Co., *Jepson* 2102; Sisson, Siskiyou Co., *Jepson* 14,435.

Var. obtusum Jepson. Plants 5 to 12 inches high; herbage glabrous; ultimate branchlets filiform, sparsely leafy; flower-buds minute, globose, obtuse; petals white, turning red, ¼ line long, scarcely exceeding the calyx-lobes.—Valleys, 4750 to 5800 feet: eastern slopes of the Sierra Nevada, Inyo Co. to Modoc Co. June-Aug.

Locs.—Long Valley, Inyo Co., *K. Brandegee;* Truckee, *T. Brandegee;* Dixey Valley, Lassen Co., *Baker & Nutting;* Willow Creek Valley, Modoc Co., *R. M. Austin;* Ft. Bidwell, Modoc Co., *Manning* 236.

Refs.—GAYOPHYTUM RAMOSISSIMUM T. & G. Fl. 1:513 (1840), type from "Rocky Mts.", *Nuttall;* Trel. Rep. Mo. Bot. Gard. 5:111, pl. 20 (1894); Jepson, Fl. W. Mid. Cal. ed. 2, 284 (1911), Man. 688, fig. 671 (1925) *Oenothera ramosissima* Nutt.; T. & G. l.c. as synonym. *Oenothera gayophytum* race *treleasiana* f. *ramosissima* Lévl. Monog. Onoth. 169 (1904), in part. *G. nuttallii* T. & G. Fl. 1:514 (1840), type from "Rocky Mts.", *Nuttall. Oenothera micrantha* Nutt.: T. & G. Fl. 1:514 (1840) as synonym. *O. gayophytum* race *phillippiana* f. *robusta* Lévl. l.c. 169 (1904). *G. nuttallii* var. *abramsii* Munz, Am. Jour. Bot. 19:772 (1925), type loc. Coldwater Cañon, San Antonio Mts., Los Angeles Co., *Abrams* 2694. *G. ramosissimum* var. *pygmeum* Jepson, Man. 689 (1925), type loc. Bullfrog Lake, Fresno Co., *Jepson* 850a; dwarf plants, 1 inch high. Var. OBTUSUM Jepson, Man. 688 (1925), type loc. Beckwith Pass, Lassen Co., *Jepson* 7755 (not 2755).

3. **G. lasiospermum** Greene. Similar to G. diffusum; petals rose-color, changing to purplish, ½ to ¾ line long.

Dry open slopes and ridges, or open pine forests, 500 to 7300 feet: mountains of coastal Southern California; Tehachapi Mts., thence north through the Sierra Nevada to Modoc Co.; White Mts.; Humboldt Co. to Siskiyou Co. North to Washington, east to Montana and Wyoming. June-Sept.

Locs.—Coastal S. Cal.: Cuyamaca Mts., *Palmer* 99; Palomar Mt., *Chandler* 5360; Strawberry Valley, San Jacinto Mts., *Hall* 2279; Seymour Creek, Mt. Pinos, *Hall* 6689. Tehachapi Mts.: Ft. Tejon, *Coville* 1180; Bisses sta., *Dudley* 373. Sierra Nevada: Kelty Mdw., Madera Co., *Kennedy;* Fresno Big Trees, *Jepson* 15,981; Emerald Bay, Lake Tahoe, *Wiggins* 5076; Bucks Valley, Plumas Co., *Jepson* 10,645; Mt. Bidwell, Warner Mts., *Jepson* 7863. White Mts.: Silver Cañon near Big Prospector Mdw., *Jepson* 7355. North Coast Ranges: Willow Creek, Trinity River valley, *Tracy* 3491; Trinity Summit, *Tracy* 5248; Siskiyou Co., *Butler* 163.

Var. hoffmannii Munz. Pubescence of short spreading hairs.—Occasional with the species.

Locs.—Cuyamaca, *T. Brandegee;* Strawberry Valley, San Jacinto Mts., *Condit;* Bluff Lake, San Bernardino Mts. (Am. Jour. Bot. 19:774); Tehachapi Mts., Lake Tahoe and Mt. Shasta (Am. Jour. Bot. 19:774). This variety has no geographic significance but the difference in pubescence is quite striking.

Var. eriospermum Jepson. Petals 1½ to 2 lines long.—Montane, essentially same range as the species.

Refs.—GAYOPHYTUM LASIOSPERMUM Greene, Pitt. 2:164 (1891), type loc. near Julian, San Diego Co., *G. W. Dunn;* Trel. Rep. Mo. Bot. Gard. 5:109, pl. 17 (1894); Jepson, Fl. W. Mid. Cal. ed. 2, 284 (1911), Man. 689 (1925). *Oenothera gayophytum* race *trelcasiana* f. *lasiospermum* Lévl. Monog. Onoth. 169 (1904). Var. HOFFMANNII Munz, Am. Jour. Bot. 19:774 (1932), type loc. Stauffer, Mt. Pinos, Ventura Co., *Hoffmann. G. helleri* var. *glabrum* Munz, Am. Jour. Bot. 19:777 (1932), type loc. Silver City, Owyhee Co., Ida., *Macbride* 398. Var. ERIOSPERMUM Jepson, Man. 689 (1925). *G. eriospermum* Cov. Contrib. U. S. Nat. Herb. 4:103 (1893), type loc. Big Tree Cañon, East Fork Kaweah River, Tulare Co., *Coville* 1316; Trel. Rep. Mo. Bot. Gard. 5:109, pl. 18 (1894); Jepson, Fl. W. Mid. Cal. ed. 2, 284 (1911).

4. **G. helleri** Rydb. var. **erosulatum** Jepson. Stems diffusely branching from the base, 6 to 8 inches high; herbage grayish, especially the leaves, with a somewhat dense cover of short spreading hairs, the young parts canescent; petals white, turning deep red, elliptic, erosulate all around, ¼ to ⅓ line long; capsules 2½ to 3 lines long, contracted into a pedicel about half as long.

Dry sandy slopes, 4000 to 9700 feet: east side of Sierra Nevada from Lassen Co. to Modoc Co. July-Aug.

Locs.—Beckwith Pass, Lassen Co.; Mt. Bidwell, Warner Mts., *Jepson* 7889.

Refs.—GAYOPHYTUM HELLERI Rydb. Bull. Torr. Club 40:65 (1913), type loc. Forest, Lewis Co., Ida., *Heller* 3433. Var. EROSULATUM Jepson, Man. 689 (1925), type loc. Beckwith Pass, Lassen Co., *Jepson* 7754.

5. **G. caesium** T. & G. Stem subsimple or diffusely branching, 6 to 9 inches high; herbage soft-pubescent or glabrous; leaf-blades linear to narrow-oblanceolate, ½ to ¾ (or 1¼) inches long; petals very small (⅓ to ½ line long); stigma globose, large; capsules pubescent, 5 to 6 lines long, the pedicel very short (½ to 1 line long).

Dry ridges or meadows, 4000 to 9500 feet: San Bernardino Mts.; Mt. Pinos; easterly summits or east side of the Sierra Nevada from Tulare Co. to Modoc Co. June-Aug.

Locs.—S. Cal. mts.: Pine Lake, Bear Valley, San Bernardino Mts., *Abrams* 2901; Bluff Lake, San Bernardino Mts., *Munz* 10,618; Mt. Pinos, Ventura Co., *Hall* 6667. Sierra Nevada: Sand Mdw., near Hockett Mdw., Tulare Co., *Jepson* 4683; betw. Tehipite Valley and Gnat Mdw., *E. Ferguson* 534; Kaiser Mdw., near Kaiser Pass, *Jepson* 16,091; Bloody Cañon, Mono Co., *Chesnut & Drew;* Donohue Pass, near Mt. Lyell, *Blasdale;* betw. Fallen Leaf and Cascade Lake, Eldorado Co., *M. S. Baker;* Susanville, *T. Brandegee;* Forestdale, sw. Modoc Co., *M. S. Baker.* White Mts.: Black Cañon, *Coville* 1797.

Refs.—GAYOPHYTUM CAESIUM T. & G. Fl. 1:514 (1840), type loc. Walla Walla, Wash., *Nuttall;* Trel. Rep. Mo. Bot. Gard. 5:113, pl. 21 (1894); Jepson, Man. 689 (1925). *Oenothera caesia* Nutt.; T. & G. l.c. as synonym. *G. racemosum* var. *caesium* Munz, Am. Jour. Bot. 19:776 (1932). *Oenothera gayophytum* race *phillippiana* f. *caesia* Lévl. Monog. Onoth. 169 (1904).

6. **G. humile** Juss. Stems erect, simple or with commonly simple ascending branches, 2 to 10 inches high, purplish; herbage glabrous; lower leaves sparse, the blades 12 lines long, upper leaves numerous, crowded, usually rather strict, the blades linear-lanceolate to oblanceolate, 6 to 10 lines long; flowers in the upper axils; petals white, turning pink, about ½ line long, not exceeding the calyx-lobes or scarcely; capsules strongly flattened contrary to the partition, markedly furrowed on each side, glabrous, 4 to 5 lines long.

Dry slopes, coniferous forests, 3000 to 9000 feet: Sierra Nevada from Tulare Co. to Shasta Co.; North Coast Ranges from Lake Co. to Humboldt Co. North to Washington and Idaho; Chile. May-Aug.

Locs.—Sierra Nevada: South Fork Middle Tule River, *Jepson* 4875a; Alta Mdws., Tulare Co., *K. Brandegee;* Millwood (Sequoia Mills), *T. Brandegee;* Huntington Lake, Fresno Co., *E. Ferguson* 374; Calaveras Big Trees, *A. L. Grant;* Truckee, Nevada Co., *Heller* 7057; Dutch

Hill, Plumas Co., *R. M. Austin;* Hot Springs Valley, Lassen Peak, *Jepson* 12,293; Goose Valley, Shasta Co., *Baker & Nutting.* North Coast Ranges: Snow Mt., Lake Co., *T. Brandegee;* Soldier Ridge, near South Yollo Bolly, *Jepson* 14,433; South Fork Mt., Humboldt Co., *Chesnut & Drew;* Van Duzen River valley, opposite Buck Mt., *Tracy* 2688.

Refs.—GAYOPHYTUM HUMILE Juss. Ann. Sci. Nat. ser. 1, 25:18, pl. 4 (1832), type from Chile, *Gay;* Jepson, Man. 689 (1925). *G. pumilum* Wats. Proc. Am. Acad. 18:193 (1883), type loc. Lake Co., *Torrey* 97; Trel. Rep. Mo. Bot. Gard. 5:114, pl. 22 (1894); Jepson, Fl. W. Mid. Cal. ed. 2, 284 (1911).

10. **GAURA** L. BUTTERFLY WEED.

Herbs with alternate leaves. Flowers white or pink, turning red, borne in spikes or racemes. Calyx-tube narrow-clavate or narrow-obconic, the whole flower above the ovary deciduous. Calyx-lobes 4. Petals 4, entire, with claws. Stamens 8. Ovary 4-celled; ovules 1 in each cell; style long. Fruit nut-like, obovoid, indehiscent or splitting at apex, 1 or 2-seeded.—Species 21, North America. (Greek gauros, proud, some of the species with primly erect flowers.)

Anthers all perfect; filaments with a scale-like appendage at base; stigma 4-lobed; perennial...... 1. *G. coccinea.*

Anthers attached at the base, those opposite the petals sterile; filaments without appendages; stigma entire; annual........................2. *G. heterandra.*

1. **G. coccinea** Pursh. Stems erect, several or many from the base, forming a bushy plant 8 to 12 inches high; herbage canescent; leaf-blades linear, remotely denticulate or entire, sessile, ½ to 1 inch long; flowers in dense terminal spikes; anthers linear, attached a little above the base; petals red, turning scarlet, 3 lines long; fruits short-ovate, strongly 4-angled, abruptly contracted to a cylindric base, pubescent, 2 lines long.

Dry slopes, 2500 to 5000 feet: eastern Mohave Desert. North to Manitoba, east to Texas, south to Mexico. May-July.

Locs.—Providence Mts., *T. Brandegee;* Barnwell, New York Mts., *K. Brandegee;* Clark Mt., Ivanpah Mts., *Mary Beal.*

Refs.—GAURA COCCINEA Pursh, Fl. 733 (1814), "upper Louisiana", i.e. on the Missouri River, *Bradbury;* Jepson, Man. 689 (1925). *G. parviflora* Torr. Ann. Lyc. N. Y. 2:201 (1828).

GAURA SINUATA Nutt.; Ser. in DC. Prod. 3:44 (1828), type loc. Arkansas and Red rivers, *Nuttall.* Herbage glabrous; stamens surpassing the petals; petals oblong-ovate, clawed, 3¼ lines long; fruit 4-angled, tapering to base and apex, glabrous, 3 lines long.—Kansas to Texas and Mexico; introduced locally as a weed at Ventura, Pasadena and Carlsbad, but doubtfully persistent.

2. **G. heterandra** Torr. Stems erect, branching, 1 to 1½ feet high; herbage minutely puberulent; leaf-blades oblong to lanceolate, 1 to 1½ inches long, on slender petioles; petals pink, 1½ to 2 lines long, the limb oval, the claw almost as long; stamens alternate petals with the ovate-cordate anthers basally attached, those opposite with lanceolate sterile anthers; fruits 1½ lines long.

Shaded rocky slopes, 1250 to 4000 (or 7000) feet: Trinity Co.; Sierra Nevada from Placer Co. to Kern Co.; Tehachapi Mts. to the San Bernardino Mts. (June-July.

Locs.—Trinity Co.: Rush Creek, *H. S. Yates* 410. Sierra Nevada: Placer Co. (Bot. Cal. 1:234); Irishtown, Amador Co., *Hansen* 530; Mokelumne Hill, Calaveras Co., *Greene;* Yankee Hill, Tuolumne Co., *A. L. Grant* 1223; Mt. Bullion, Bear Valley, Mariposa Co., *Bolander* 4941; Hites Cove, Mariposa Co., *Congdon;* Piedra, Fresno Co., *H. P. Kelley;* Cedar Creek, North Fork Kaweah River, *Jepson* 590; Middle Tule River, *Purpus* 5587; Piute Peak, Kern Co., *Purpus* 5055. Tehachapi Mts.: Tehachapi Peak, *Dudley* 366; Old Fort Tejon, Kern Co., *Hall* 6287. S. Cal.: Liebre Mts., Los Angeles Co., *Peirson;* Jobs Peak, San Bernardino Mts., *Parish* 2371.

Refs.—GAURA HETERANDRA Torr. Pac. R. Rep. 4:87 (1857), type loc. river banks, Mokelumne Hill, *Bigelow;* Jepson, Man. 690 (1925). *Heterogaura californica* Rothr. Proc. Am. Acad. 6:354 (1864), a renaming (privileged under the "Kew Rule") of Gaura heterandra Torr. *H. heterandra* Cov. Contrib. U. S. Nat. Herb. 4:106 (1893).

11. CIRCAEA L. ENCHANTER'S NIGHTSHADE

Low slender perennials with thin opposite petioled leaves. Flowers small, white, in terminal and lateral racemes. Calyx-tube obconic, very short, the base nearly filled by a cup-shaped disk, deciduous. Calyx-lobes 2, reflexed. Petals 2, obcordate. Stamens 2, alternate with the petals. Ovary 1 or 2-celled, each cell 1-ovuled. Fruit 1-celled, 1-seeded, indehiscent, pear-shaped and bristly with hooked hairs.—Species 7, North America, Europe and Asia. (Circe, sea-nymph, daughter of the Sun and of Perse.)

1. **C. pacifica** Asch. & Mag. Stem from a short rootstock, usually simple, 6 to 14 inches high; herbage glabrous; leaf-blades orbicular to mostly ovate, obtuse to cordate at base, acuminate, obscurely repand-denticulate or almost entire, 1 to 2 inches long, on petioles ¾ to 1 inch long; racemes bractless; flowers ½ line long; calyx white; fruit ¾ to 1 line long.

Rich humus in moist shady woods: San Bernardino Mts., 4300 to 7400 feet; North Coast Ranges from Marin Co. to Siskiyou Co., 200 to 3500 feet; Sierra Nevada from Tulare Co. to Modoc Co., 4000 to 7000 feet. North to British Columbia and Idaho. June-Aug.

Locs.—San Bernardino Mts.: Little Bear Valley, *Chandler;* Sawpit Cañon, *Ewan* 5160. Coast Ranges: Papermill Creek, Marin Co., *Jepson* 8279; Willow Creek, Trinity River Valley, Humboldt Co., *Tracy* 3311; Sisson, *Jepson* 14,387; Shackelford Creek, Siskiyou Co., *Butler* 1499. Sierra Nevada: Marble Fork, Tulare Co., *Jepson* 646; Huntington Lake, *A. L. Grant* 1148; Grouse Creek, betw. Yosemite and Wawona, *Jepson* 4286; Brightman Flat, Tuolumne Co., *A. L. Grant* 890a; Snowdon ranch, Calaveras Big Trees, *Jepson* 14,388; Bear Valley, Nevada Co., *Jepson* 14,389; Pioneer sta., Sierra Co., *Jepson* 16,806; Taylor Creek, Forestdale, sw. Modoc Co., *M. S. Baker.*

Refs.—CIRCAEA PACIFICA Asch. & Mag. Bot. Zeit. 29:392 (1871), type loc. "a 37–49° latitud. bor. in California nempe ad molendinum chartarium pr. San Francisco (Bolander!)", undoubtedly Papermill Creek, Marin Co., where it is still found; Jepson, Fl. W. Mid. Cal. 338 (1901), ed. 2, 284 (1911), Man. 690 (1925). *C. lutetiana* Bol. Cat. Pl. S. F. 12 (1870), not L. (1753).

HALORAGEAE. WATER-MILFOIL FAMILY

Perennial aquatic herbs, the leaves (in ours) in whorls. Flowers sessile in the axils of leaves or bracts, perfect or unisexual. Calyx-tube coherent with the ovary, the limb very short or obsolete. Petals small or none. Stamens 1, 4, or 8. Ovary 1 to 4-celled; stigmas 1 to 4. Fruit a 1-seeded indehiscent nutlet, or 4-lobed and splitting into 4 nutlets.

Bibliog.—Brewer, W. H., and Watson, S., Halorageae in Bot. Cal. 1:214–216 (1876). Schindler, A. K., Halorrhagaceae (Engler, Pflzr. 4^{225}:1–133, figs. 1–36,—1905).

Leaves all entire; flowers perfect; stamen 1; ovary 1-celled..1. HIPPURIS.
Immersed leaves capillary-dissected; flowers polygamous; stamens 4 or 8; ovary 4-celled..............
2. MYRIOPHYLLUM.

1. HIPPURIS L.

Stems erect, unbranched. Leaves simple, their blades entire, sessile. Flowers minute, usually perfect, sessile in the axils. Petals none. Calyx-limb a narrow entire rim. Stamen 1, inserted on the anterior edge of the calyx. Style 1, filiform, stigmatic down one side. Ovary 1-celled, becoming a 1-seeded nutlet.—Species 3, north temperate and arctic zones and in Patagonia. (Greek hippos, a horse, and oura, a tail.)

1. **H. vulgaris** L. MARE'S TAIL. Stem simple, 1 to 2 feet long (commonly emersed 4 to 7 inches); herbage glabrous; leaves about 7 to 10 in a whorl, their blades linear, acute, 6 to 9 lines long; fruit nearly 1 line long.

Shallow margins of ponds and about springs, 5 to 7000 feet: infrequent but widely distributed in California. North America, Europe, Asia, Patagonia. May-July.

Locs.—North Coast Ranges: Crescent City, *M. S. Baker* 287; Stone Lagoon, n. Humboldt Co., *Jepson* 9335; Bucksport, Humboldt Co., *Tracy* 3737; Little River (at mouth), *Tracy* 4807; Tomales Bay (Bot. Cal. 1:215). Sierra Nevada region: Ft. Bidwell, *Manning;* Honey Lake, *Davy* 3334; Squaw Valley, Placer Co., *Sonne;* Tuolumne Soda Sprs., *Bolander* 6385; North Fork Kings River, *Hall & Chandler* 428. San Bernardino Mts.: Bear Valley, *Parish* 1432.

Refs.—Hippuris vulgaris L. Sp. Pl. 4 (1753), type European; Jepson, Fl. W. Mid. Cal. 338 (1901), ed. 2, 284 (1911), Man. 690 (1925).

2. MYRIOPHYLLUM L.

Emersed leaves with entire or pectinate blades, those under water pinnately divided into capillary divisions. Flowers sessile in the axils of the opposite upper leaves or the whorls forming a terminal interrupted spike. Upper flowers generally staminate, the lowest pistillate, and the intermediate often perfect. Calyx of the pistillate flowers 4-toothed or the teeth none, of the staminate 4-lobed. Petals 4, or none. Stamens 4 or 8. Stigmas 4, recurved and plumose. Fruit splitting at maturity into 4 bony 1-seeded nutlets.—Species 18, widely distributed over the whole earth. (Greek murios, a thousand, and phullon, a leaf.)

Flowers in a terminal interrupted spike; petals fugacious; stamens 8.
  Bracts entire or toothed, shorter than the flowers........1. *M. spicatum.*
  Bracts pectinate, longer or shorter than the flowers........2. *M. verticillatum.*
Flowers in the axils of the emersed linear leaves; petals subpersistent; stamens 4........3. *M. hippurioides.*

1. **M. spicatum** L. var. **exalbescens** Jepson. American Milfoil. Stems branching, 1 to 2 feet long; leaves in whorls of 3 or 4, their blades dissected into capillary divisions; whorls of flowers forming an interrupted spike 1 to 4 inches long, the bracts ovate, entire or serrate and usually shorter than the flowers; nutlets 1 line long, fully as thick, rounded on the back.

Lakes, ponds and ditches, 20 to 7000 feet: stations in California few and widely scattered. North to the Arctic, east to Arizona and to New England. June-Aug.

Locs.—Merrillville, Lassen Co., *Jepson* 8002; Little River (mouth), Humboldt Co., *Tracy* 5395; Camp Taylor, Marin Co. (Behr, Fl. Vic. S. F. 239); Mountain Lake, San Francisco, *Jepson* 14,137; Rancho Verde, Victorville, Mohave Desert, *Parish* 10,570; Bear Valley, San Bernardino Mts., *S. B. & W. F. Parish* 1433.

Refs.—Myriophyllum spicatum L. Sp. Pl. 992 (1753), type European. Var. exalbescens Jepson, Man. 691 (1925). *M. exalbescens* Fer. Rhod. 21:120 (1919), type loc. York River, Quebec, *Williams, Collins & Fernald. M. spicatum* Jepson, Fl. W. Mid. Cal. 339 (1901), ed. 2, 285 (1911).

2. **M. verticillatum** L. Myriad-leaf. Submerged leaves in crowded whorls of 30 and 40, the capillary divisions often finer than those of no. 1; floral leaves pectinate-pinnatifid; spike 2 to 6 inches long; petals of the staminate flower purplish; nutlets somewhat gibbous at base.

Lakes, 1400 feet: rare in the North Coast Ranges. North to British Columbia and east to the Atlantic. Europe, Asia, north Africa. June.

Loc.—Clear Lake, *A. B. Simonds.*

Refs.—Myriophyllum verticillatum L. Sp. Pl. 992 (1753), type European; Jepson, Man. 691 (1925).

3. **M. hippurioides** Nutt. Western Milfoil. Stems simple or branching, 1 to 2 feet long; leaves in whorls of 4 or 5; blades of emersed ones linear, about ½ line wide, conspicuously or obscurely serrate or the uppermost nearly entire, 3 to 5 lines long; blades of submersed ones pinnately dissected into capillary divisions, ½ to 1½ inches long; flowers chiefly in the axils of the emersed leaves; petals white, obovate; nutlets less rounded than in no. 1.

Lakes and sloughs, 0 to 4400 feet: stations few and scattered in central California. North to Washington, east to Georgia and south to Mexico. June-Sept.

Locs.—Big Mdws., Plumas Co., *R. M. Austin;* Mt. Hanna, Lake Co., *Jepson* 14,138; Stockton, *Sanford.*

Refs.—MYRIOPHYLLUM HIPPURIOIDES Nutt.; T. & G. Fl. 1:530 (1840), type loc. ponds of the Willamette River, Ore., *Nuttall;* Jepson, Fl. W. Mid. Cal. 339 (1901), ed. 2, 285 (1911), Man. 691 (1925).

ARALIACEAE. ARALIA FAMILY

Ours perennial herbs. Closely allied to Umbelliferae, but the stems solid, the petals not inflexed and the ovary 2 to 5-celled. Petals, stamens and styles 5. Calyx-tube coherent with the ovary, its limb a mere rim with 5 salient teeth. Fruit berry-like, containing as many 1-seeded nutlets as there are carpels.—Genera 51, species 400, all continents, but mostly tropical.

1. ARALIA L.

Leaves alternate, very large, compound. Flowers small, whitish, borne in panicled umbels, the pedicels pointed. Styles united to the middle. Embryo minute.—Species 30, all continents save Africa. (Derivation uncertain.)

1. **A. californica** Wats. ELK CLOVER. Stems simple, stout, 6 to 10 feet high, arising from a large rootstock with milky juice; herbage glabrous, subulate-scabrous on the main stem; leaves 1 to 5 feet long, the blades ternate, then pinnately 3 to 5-foliolate, 1 to 5 feet long; leaflets ovate, sometimes elliptic, serrate, acuminate, subcordate at base, ½ to 1 foot long; panicles 1 to 1½ feet long; flowers 1½ lines long, on pedicels ½ inch long; ovary red, becoming a globular black berry 2½ lines in diameter.

Shaded cañons in moist spots and beds of living mountain streams, 100 to 2500 feet: Coast Ranges from Del Norte and Siskiyou Cos. to San Luis Obispo Co.; Sierra Nevada from Plumas Co. to Calaveras Co.; coastal Southern California. July.

Geog. note.—Aralia californica has not been reported from the Sierra Nevada south of Calaveras Co., nor is it known nor to be expected in the inner Coast Range from the Yollo Bolly Mts. southward to the Diablo Range between Fresno Co. and San Luis Obispo Co. In the northern Sierra Nevada, where it is only slightly known, many stations for it, between Shasta Co. and Amador Co., will probably be discovered. In Trinity Co. it is called Spig-nut.

Locs.—Quartz Creek, Del Norte Co., *Jepson;* Russian Creek, Siskiyou Co., *Butler* 457; Shasta Sprs., *Condit;* Martin ranch, South Fork Trinity River, *Jepson* 2006; Hupa, *Goddard;* Rattlesnake Creek, nw. Mendocino Co., *Jepson* 9450; Ft. Bragg, *W. C. Mathews* 175; Calistoga, *Jepson* 14,139; Howell Mt., *Jepson;* Inverness, *Jepson;* Mt. Tamalpais, *Jepson;* Berkeley Hills, *Jepson* 8189; Loma Prieta, Santa Cruz Mts., *Elmer* 4987; Gabilan Mts., *Brewer* 747; Santa Lucia Creek (west fork), Santa Lucia Mts., *Jepson;* Lucia to Mill Creek, Santa Lucia Mts., *Jepson;* Lopez Cañon, San Luis Obispo Co., *Condit* 227. Sierra Nevada: Belden, Plumas Co., *Jepson;* Rich Pt., Middle Fork Feather River, *Jepson;* Calaveras Big Trees. S. Cal.: Santa Anita Cañon, San Gabriel Mts., *Peirson* 131; San Bernardino foothills, *Parish;* Cold Water Cañon, Santa Ana Mts., *Zumbro.*

Refs.—ARALIA CALIFORNICA Wats. Proc. Am. Acad. 11:144 (1876), type loc. "northern California"; Jepson, Fl. W. Mid. Cal. 339 (1901), ed. 2, 285 (1911), Man. 691, fig. 672 (1925).

UMBELLIFERAE. PARSLEY FAMILY

Herbs with commonly hollow stems and often dilated petioles. Leaves commonly alternate or basal, compound (sometimes simple), usually much incised or divided. Flowers small, in compound umbels, or the umbels sometimes simple or capitate. Umbels when compound with the peduncle divided at summit into a number of rays, each ray bearing a secondary umbel termed an umbellet. Umbellets commonly subtended by bractlets (forming an involucel); rays commonly subtended by bracts (forming an involucre). Calyx-tube wholly adnate to the ovary; calyx-teeth small, sometimes obsolete. Petals 5, usually with an inflexed tip. Stamens 5, inserted on an epigynous disk. Ovary inferior, 2-celled, one hanging ovule in each cell. Styles 2, united below and forming a swollen or cushion-like base (stylopodium). Fruit consisting of two carpels united by their faces (commissure), flattened laterally (i. e., flattened sidewise or contrary to the commissure), or flattened dorsally (i. e., each carpel flattened on the back or parallel with the commissure), or not flattened at all. Each carpel with 5 ribs or ridges, one down the back (dorsal rib), 2 on the edge near the commissure (lateral ribs), and 2 between the dorsal and lateral ribs (intermediate ribs). Between the ribs are the spaces called intervals:—the dorsal intervals are those next to the dorsal rib; the lateral intervals are those next to the lateral ribs. Beneath the intervals (in the tissue of the pericarp), as also on the commissural side, are oil-tubes. Carpels 1-seeded, splitting apart at maturity, each borne on a filiform division of the receptacle (or carpophore) which is prolonged between them. The "seed-face" is against the commissure. Embryo small; endosperm cartilaginous.—The inflorescence is frequently irregularly compound; in a few genera the fruit has no ribs, and in others no oil-tubes. The number of oil-tubes in a given species is, generally speaking, a reliable character but it should be noted that there is here, also, considerable variation. The character of the ribs and oil-tubes should be ascertained by examination of perfectly mature fruit. Many of the species are poisonous or have poisonous parts, although many others, such as Parsley, Carrot and Parsnip, have edible organs and are classed as food plants.—Genera about 230, species 2600, all continents.

Bibliog.—Watson, S., Western N. Am. species of Peucedanum (Proc. Am. Acad. 11:141–145,—1876). Coulter, J. M., and Rose, J. N., Some notes on western Umbelliferae (Bot. Gaz. 13:77–81, 141–146, 208–211,—1888); Revision of N. Am. Umbelliferae 1–144, pls. 1–9 (1888); Notes on N. Am. Umbelliferae (Bot. Gaz. 14:274–284,—1889); Revision of Lilaeopsis (Bot. Gaz. 24:47–49, figs. 1–4,—1897); Monog. N. Am. Umbelliferae (Contrib. U. S. Nat. Herb. 7:9–256, figs. 1–65 and pls. 1–9,—1900); Suppl. (l.c. 12:441–455,—1909). Greene, E. L., Concerning some California Umbelliferae (Pitt. 1:269–276,—1889); Vegetative characters of the species of Cicuta (Pitt. 2:1–11,—1889); New species of Cicuta (Lflts. 2:236–241,—1912). Parish, S. B., Tuberiferous roots of Hydrocotyle americana Kell. (Zoe 2:116–117,—1891). Jepson, W. L., Studies in Californian Umbelliferae (Erythea 1:8–10,—1893); Revision of Californian Umbelliferae (Madroño 1:101a–114, 117–130, 133–146, 149–162, 281–285, figs. 1–38,—1923–1929). Hedrick, U. P., A plant that poisons cattle, Cicuta vagans Greene (Ore. Agr. Exp. Sta. Bull. 46:1–12, pls. 1–4,—1897). Wolff, H., Umbelliferae-Saniculoideae (Engler, Pflzr. 4^{228}:1–305, figs. 1–42,—1913); Umbelliferae-Apioideae-Ammineae-Carinae, Ammineae novemjugatae et genuineae (l.c. 4^{228}:1–398, figs. 1–26,—1927). Marsh, C. W., and Clawson, A. B., Cicuta or water hemlock (U. S. Dept. Agr. Bull. 69:1–27, pls. 1–4,—1914). Hoar, C. S., Comparison of the stem anatomy of the cohort Umbelliferae (Ann. Bot. 29:55–63, pls. 4–5,—1915). Macbride, J. F., Certain N. Am. Umbelliferae (Contrib. Gray Herb. 56:28–35,—1918). Hill, A. W., The genus Lilaeopsis (Journ. Linn. Soc. Bot. 47:525–551, figs. 1–16 and pls. 19–20,—1927). Mathias, M. E., Studies in the Umbelliferae. I. Glehnia (Ann. Mo. Bot. Gard. 15:91–112, fig. 1, pls. 17–20,—1928); II. [Notes on] Neoparrya, Eryngium and Pimpinella (l.c. 16:393–398, pl. 33,—1929); III. A monograph of Cymopterus, including a critical study of related genera (l.c. 17:213–476, pls. 21–51,—1930). Jackson, G., A study of the carpophore of the Umbelliferae (Am. Jour. Bot. 20:121–144,—1933).

A. Fruit not prickly or scaly (sometimes hairy, rarely tuberculate or scabrous as nos. 6 and 7).

I. RIBS OF THE FRUIT NOT WINGED; FRUIT NOT FLATTENED DORSALLY, SOMETIMES A LITTLE FLATTENED LATERALLY.

1. Oil-tubes none.

Stems creeping or trailing; leaves simple; umbel simple or proliferous.
  Leaves alternate or basal, the blades orbicular or peltate; carpels with filiform ribs; perennials..........1. HYDROCOTYLE.
  Leaves opposite, the blades usually cordate; carpels without ribs; annuals..........2. BOWLESIA.
Stems erect; leaves decompound; stem purple-dotted..........3. CONIUM.

2. Oil-tubes present.

Petals conspicuously unequal; lower leaves with broad leaflets, the upper dissected..........4. CORIANDRUM.
Petals equal or essentially so.
  Ribs not corky-thickened.
    Flowers white, rarely pinkish, or at least not yellow.
      Oil-tubes solitary in the intervals.

Umbels (at least some of them) sessile or subsessile in the forks, as well as terminal on the branches.

Leaves with large leaflets; umbels with about 5 to 16 rays; fruit elliptic-ovate, not tuberculate; biennial..5. APIUM.

Leaves dissected into linear lobes; umbels 3 or 4-rayed; fruit elliptic-cordate, tuberculate; annual..6. APIASTRUM.

Umbels terminal on the branches.

Ribs prominent, conspicuously scabrous; umbels with unequal rays; annuals..7. AMMOSELINUM.

Ribs filiform, smooth; umbels with equal or subequal rays.

Bracts 3-parted to the middle into filiform divisions, closely reflexed; upper leaves ternately decompound and dissected; biennials.. 8. AMMI.

Bracts entire or merely toothed, spreading or rarely reflexed; leaves pinnate or bipinnate; leaflets entire; perennials....9. CARUM.

Oil-tubes 2 or more in the intervals, at least in some of them.

Pedicels of the flowers equal or nearly so; calyx-teeth not rigid.

Leaves once to thrice ternate or pinnate; mostly tall plants.

Leaflets linear, mostly entire; ribs filiform....................10. EULOPHUS.

Leaflets ovate, incised; ribs prominent, acute..............11. LIGUSTICUM.

Leaves pinnate or bipinnate, the divisions or leaflets oblong, entire; alpine dwarf..12. PODISTERA.

Pedicels of the sterile flowers surpassing or equaling the fruit; sterile calyx-teeth rigid-subulate, very prominent..............................13. OREONANA.

Flowers yellow.

Stems of medium height, the leaves mostly basal; leaflets broad..............14. VELAEA.

Stems very tall, leafy; leaves dissected into numerous filiform segments.................... 15. FOENICULUM.

Ribs, or some of them, corky.

Oil-tubes solitary in the intervals; plants of marshes or stream banks.

Ribs confluent, forming a continuous corky covering; leaves simply pinnate.............. 16. BERULA.

Ribs corky but distinct.

Stems erect; leaves plane, with serrate leaflets.

Styles short (about ⅕ to ⅓ as long as the fruit); fruit broadly ovate or roundish..17. CICUTA.

Styles long (about ½ as long as the fruit); fruit subcylindric.................... 18. OENANTHE.

Stems creeping; leaves consisting of hollow cylindrical petioles.......................... 19. LILAEOPSIS.

Oil-tubes 2 or more in the intervals, at least in some of them.

Leaves simply pinnate; stems leafy; ribs all corky; marsh or aquatic plants.............. 20. SIUM.

Leaves once or twice ternate, all basal; lateral ribs corky-thickened, the others slender; slopes towards the arid interior (transmontane)..........21. OROGENIA.

II. SOME OR ALL OF THE RIBS OF THE FRUIT WINGED.

Lateral ribs winged, the dorsal and intermediate ribs filiform; fruit flattened dorsally.

Corollas of marginal flowers of umbel radiately enlarged; oil-tubes reaching only half way to base of fruit; tall coarse plants..22. HERACLEUM.

Corollas all alike; oil-tubes as long as the fruit (except in no. 25).

Leaves and peduncles arising from the root-crown, or from only a very short proper stem.

Lateral wings of fruit corky-thickened; flowers commonly yellow; tall plants with large ample leaves..23. LEPTOTAENIA.

Lateral wings thin; flowers yellow, white or purple; low plants with medium or small leaves..24. LOMATIUM.

Stems tall, leafy.

Dorsal and intermediate ribs 3; flowers yellow.

Leaves pinnate, the leaflets ovate, toothed..25. PASTINACA.

Leaves ternately compound and dissected into filiform segments..26. ANETHUM.

Dorsal and intermediate ribs apparently 5; leaves simply pinnate; flowers white...... 27. OXYPOLIS.

Lateral, dorsal and intermediate ribs all winged or very prominent.

Tall plants with leafy stems; flowers white.

Umbellets not capitate.

Ribs not corky-thickened; fruit flattened dorsally; petioles not inflated.

Leaflets incised or deeply toothed; oil-tubes solitary in the intervals.................. 28. CONIOSELINUM.

Leaflets not incised, merely serrate or toothed or entire; oil-tubes 1 to 3 in the intervals........29. ANGELICA.
Ribs very thick and corky; fruit slightly flattened laterally if at all; petioles inflated........30. COELOPLEURUM.
Umbellets capitate; fruit cuneate-obovate, flattened dorsally, pubescent........31. SPHENOSCIADIUM.
Mostly low plants, the leaves and peduncles all basal; oil-tubes several in the intervals; flowers white, yellow or purple; fruit flattened dorsally or not at all........32. CYMOPTERUS.

B. Fruit bearing prickles, bristles or scales.

Ribs none; oil-tubes none except in no. 34.
  Fruit covered with hyaline scales; flowers greenish-white or blue, in dense heads; prickly perennial herbs........33. ERYNGIUM.
  Fruit bur-like, covered with hooked prickles.
    Flowers yellow or purple, mostly in head-like clusters; perennials........34. SANICULA.
    Flowers white, in compound umbels; annuals........35. ANTHRISCUS.
Ribs present; flowers white.
  Oil-tubes none or obscure.
    Fruit with an elongated beak several times longer than the muriculate body; annuals........36. SCANDIX.
    Fruit not beaked or with a short beak several times shorter than the smooth body; ribs bristly; perennials........37. OSMORRHIZA.
  Oil-tubes present, usually conspicuous.
    Fruit somewhat flattened dorsally; prickles barbed; calyx-teeth obsolete; umbel compound........38. DAUCUS.
    Fruit flattened laterally; bristles hooked; calyx-teeth obvious.
      Umbels subcapitate, opposite the leaves; fruit prickly on one carpel, warty on the other........39. TORILIS.
      Umbels compound, terminal and lateral; fruit prickly on both carpels..40. CAUCALIS.

1. HYDROCOTYLE L.

Perennial glabrous herbs, the peduncles and leaves from creeping stems or rootstocks. Leaves simple, the blades round in outline, long-petioled. Flowers in a small simple umbel, or disposed in 2 or more umbels which are proliferous one above the other. Involucral bracts present in ours, small (½ line long). Fruit flattened laterally, suborbicular, the dorsal rib prominently margined and with one or 2 filiform ribs on each side. Oil-tubes none.—Species 78, all continents. (Greek hudor, water, and cotule, a low vessel, the peltate leaves of some species being saucer-shaped.)

Leaves not peltate, 5 or 6-cleft; umbels simple........1. *H. ranunculoides.*
Leaves peltate, more or less crenate.
  Umbels simple; fruit notched at base and apex........2. *H. umbellata.*
  Umbels proliferous, forming an interrupted spike.
    Fruit not notched at base, sessile or on very short pedicels........3. *H. verticillata.*
    Fruit notched at base, the pedicels 1½ to 7 lines long........4. *H. prolifera.*

1. **H. ranunculoides** L. f. WATER PENNYWORT. Stems floating or creeping in mud, rooting at the nodes; leaf-blades orbicular, (¾ or) 1 to 1¾ inches broad, 5 or 6-cleft, the lobes crenulate; petioles 3 to 5 (or 9) inches long; peduncles ½ to 2½ inches long, reflexed in fruit; pedicels ½ line long; fruit ovoid, 1 line broad; ribs obscure.

Pools or muddy shores, often floating in deep water, 5 to 4600 feet: South Coast Ranges to Southern California. East to the Atlantic. May, fr. July.

Locs.—Butano Creek, San Mateo Co., *Jepson* 4161; Milpitas, *R. J. Smith;* San Jose, *Jepson* 14,237; Moss Ldg., Monterey Co., *Abrams* 4056; Victorville, *Jepson* 5608; Thomas Valley, San Jacinto Mts., *Hall* 2168; Bubbling Spr., Collins Valley, *Jepson* 8836; Warner Ranch, San Diego Co., *T. Brandegee;* Laguna Mts., *T. Brandegee.*

Refs.—HYDROCOTYLE RANUNCULOIDES L. f. Suppl. 177 (1781), type loc. Mexico; Jepson, Fl. W. Mid. Cal. 342 (1901), ed. 2, 288 (1911), Man. 705, fig. 685 (1925).

2. **H. umbellata** L. SAND PENNYWORT. Petioles and peduncles subequal, 1½ to 4 (or 10) inches high, arising from slender creeping rootstocks with descending branches bearing round tubers; leaves peltate, the blades orbicular, crenate, 4 to 7 (or 14) lines broad; umbels many-flowered, simple (rarely slightly proliferous); bracts of involucre short, ovate; pedicels 1¾ to 6 lines long; fruit ¾ to 1 line long, strongly notched at base and apex; dorsal rib prominent but obtuse.

Wet often sandy bottoms, 5 to 4000 feet: Southern California. East to the Atlantic, south to Mexico. Apr., fr. June.

Locs.—Los Angeles River, *Braunton* 533; Buena Park, Orange Co., *C. W. Hamlin;* Riverside, *Jepson* 1583a; San Bernardino, *Parish;* Lytle Creek, e. San Gabriel Mts., *Peirson* 2141; Rancho Verde, sw. Mohave Desert, *Parish* 9704; Covington ranch, Conchilla Range, *Munz* 5283.

Refs.—HYDROCOTYLE UMBELLATA L. Sp. Pl. 234 (1753), type from North America; Jepson, Man. 705 (1925).

3. **H. verticillata** Thunb. SPIKE PENNYWORT. Similar in habit to no. 2; umbels forming an interrupted spike of 3 to 5 whorls; fruit shortly pediceled or sessile.

Moist spots, 50 to 1500 feet: Colorado Desert. East to the Atlantic. Apr., fr. July.

Loc.—San Diego Co., *Orcutt.*

Var. **cuneata** Jepson. Fruits very abruptly short-acute at base.—Southern California; San Francisco Bay region; northern Sierra Nevada. East to Texas.

Locs.—Jamul, San Diego Co., *Orcutt;* Lake Hodges, San Diego Co., *MacFadden;* Santa Barbara (Contrib. U. S. Nat. Herb. 7:28); Asilomar, Monterey, *Parish* 11,537; Crystal Springs Lake, San Mateo Co., *Elmer* 4960; Suisun Marshes, *Jepson* 14,238; Mohawk Valley, Plumas Co., *Lemmon* 2710.

Refs.—HYDROCOTYLE VERTICILLATA Thunb. Diss. 2:415, pl. 3 (1800), type loc. unknown acc. Coulter & Rose, Contrib. U. S. Nat. Herb. 7:27; Jepson, Man. 705 (1925). Var. CUNEATA Jepson, Madroño 1:124 (1923); Man. 705 (1925). *H. cuneata* C. & R. Contrib. U. S. Nat. Herb. 7:28, fig. 1 (1900), type loc. Montezuma Well, Ariz., *McDougall* 575; Jepson, Fl. W. Mid. Cal. ed. 2, 288 (1911).

4. **H. prolifera** Kell. MARSH PENNYWORT. Peduncles and petioles subequal, 6 to 12 inches high; descending branches of the rootstock tuberous-enlarged; leaves peltate, the blades orbicular, emarginate at base, slightly crenate, 1¼ to 1¾ inches broad; umbels proliferous, one above the other in 2 to 4 whorls; pedicels 1½ to 7 lines long; mature fruit 1 line long and slightly broader, slightly notched at base and apex.

Wet bottoms, 5 to 500 feet: delta of the lower Sacramento and San Joaquin rivers and west to the coast. June, fr. Aug.-Sept.

Locs.—Bouldin Isl. (Zoe 4:214); Antioch, *Condit;* Santa Rosa, *M. S. Baker;* San Francisco (Contrib. U. S. Nat. Herb. 7:26).

Refs.—HYDROCOTYLE PROLIFERA Kell. Proc. Cal. Acad. 1:15 (1854), type loc. about San Francisco, *Kellogg;* Jepson, Fl. W. Mid. Cal. 342 (1901), ed. 2, 288 (1911), Man. 705 (1925).

2. **BOWLESIA** R. & P.

Delicate annuals with stellate pubescence, opposite simple leaves and scarious lacerate stipules. Umbels simple, few-flowered, on short axillary peduncles. Bracts in ours few and scarious or none. Flowers white, minute. Calyx-teeth prominent. Fruit ovate, somewhat flattened laterally, with narrow commissure; carpels turgid, becoming depressed on the back. Ribs and oil-tubes none.—Species 18, South and North America. (Wm. Bowles, 1705-1780, Irish naturalist and traveler.)

1. **B. lobata** R. & P. (Fig. 267.) Stems mostly branching at the base, weak and trailing, ½ to 2 feet long, flowering from the base; leaf-blades suborbicular-cordate (or sometimes suborbicular) but always broader than long, thin, mostly 5-lobed, ½ to 1 inch broad, the lobes entire or some of them 1 or 2-toothed; petioles 1 to 3 inches long or the upper shorter; umbels 1 to 4-flowered; fruit 1 line long.

Shady places, usually amongst rocks, in the hills, 50 to 2500 feet: Coast Ranges from Sonoma and Contra Costa Cos. to San Luis Obispo Co.; Sierra Nevada from Amador Co. to Tulare Co.; coastal Southern California. East to Texas, south to Mexico. Peru. Mar.-Apr.

Locs.—Sierra Nevada: Drytown, Amador Co. (Contrib. U. S. Nat. Herb. 7:31); betw. Mokelumne Hill and San Andreas, *F. E. Blaisdell;* Mariposa Co. foothills (Zoe 3:29); Kaweah, *Hopping* 544. Tehachapi Mts.: Caliente (Contrib. U. S. Nat. Herb. 7:31). Coast Ranges: Humboldt Co. (Contrib. U. S. Nat. Herb. 7:31); Petaluma, *Bolander* 4633; North Berkeley Hills, *Chandler;* Mt. Diablo, *Jepson* 9867a; San Leandro Creek, Alameda Co., *Kellogg;* Potrero Hills, San Francisco, *Kellogg;* La Honda, San Mateo Co., *C. F. Baker* 510; Pacific Grove, *Heller* 6498; Paso Robles, *Condit;* Cayucos, San Luis Obispo Co., *R. S. Ferris* 7677. S. Cal.: Mission La Purisima, Santa Barbara Co., *Jepson* 11,936; Ojai Valley, *Hubby;* Santa Paula, *Benj. Cobb;* Tuna Cañon, Verdugo Hills, *MacFadden;* Playa del Rey, Los Angeles Co., *Braunton* 827; San Bernardino, *Parish;* Anaheim, *Alice King;* Escondido, *C. V. Meyer* 96; Witch Creek, *Alderson.*

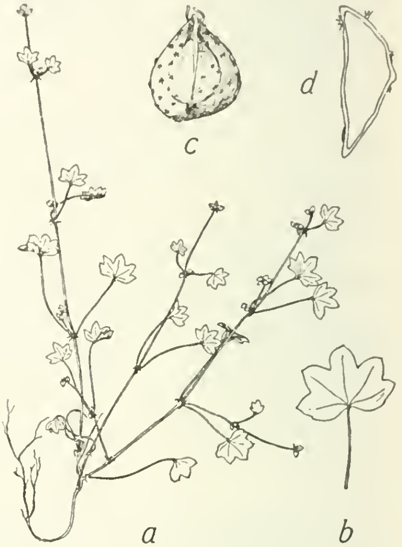


Fig. 267. BOWLESIA LOBATA R. & P. *a*, habit, × ½; *b*, leaf, × 1; *c*, carpel, × 7; *d*, cross sect. of carpel, × 10.

Refs.—BOWLESIA LOBATA R. & P. Fl. Peruv. 3:28 (1802), type from Peru; Jepson, Fl. W. Mid. Cal. 342 (1901), ed. 2, 287 (1911), Man. 705 (1925). *B. septentrionalis* C. & R. Contrib. U. S. Nat. Herb. 7:31, fig. 3 (1900), type loc. near Tucson, Ariz., *Myrtle Zuck.*

3. CONIUM L.

Tall branching biennial with dissected decompound leaves. Flowers white, in compound umbels. Involucre and involucels small. Calyx teeth obsolete. Fruit broadly ovate, somewhat laterally flattened. Ribs prominent. Oil-tubes none.—Species 2, Europe, Asia and Africa. (Koneion, Greek name of the Hemlock.)

1. **C. maculatum** L. POISON HEMLOCK. Tall (4 to 10 feet high), the stem dotted with purple marks; herbage with a mouse-like odor; leaves 1 to 2 feet long or more, the segments incised or pinnatifid; rays 10 to 16, ¾ to 1¼ inches long; bractlets ovate-lanceolate, commonly 3; fruit 1½ lines long, shorter than the pedicels.

European weed, widely naturalized in shady or low moist ground, 1 to 5000 feet: throughout California but mostly cismontane. May-Sept.

Note on introduction.—The date of introduction of Conium maculatum is not known to us. It was observed prior to 1876, but was unknown to H. N. Bolander in the San Francisco Bay region in 1870. In 1891 E. L. Greene records it as "rather rare in California" (Fl. Fr. 319). In recent years, from about 1917 to 1927, it has spread widely and conspicuously along creek banks and stream benches and often forms extensive thickets in moist bottoms. All parts of the plant are poisonous, but the root when eaten is more likely to prove fatal.

Locs.—San Andreas, *Jepson* in 1923; Truckee, *Sonne* in 1892; Yreka, *Butler* 924 in 1909; Falks Mill, South Fork Elk River, *Tracy* 4496 in 1914; Greenwood, Mendocino Co., *Jepson* in 1902; Drakes Bay, *Jepson* in 1900; Mormon Isl., *T. Brandegee* in 1884; Lake Merced, San Francisco, *Eastwood* in 1895; Alviso, *Jepson* 9318 in 1921; Carmel, *Newlon* 120 in 1921; San Luis Obispo, *Jepson* in 1927; Arroyo Grande, *Alice King;* Lytle Creek, e. San Gabriel Mts., *Peirson* 2115 in 1920; San Bernardino, *Parish* 12,001 in 1918.

Refs.—CONIUM MACULATUM L. Sp. Pl. 243 (1753), type European; Jepson, Fl. W. Mid. Cal. 349 (1901), ed. 2, 294 (1911), Man. 706, fig. 686 (1925).

4. CORIANDRUM L.

Slender glabrous strong-smelling annual with leafy stems. Leaves markedly dimorphic, the lower pinnate or bipinnate with broad leaflets, the upper finely dissected. Flowers white or rose-tinted, the petals conspicuously unequal. Umbels compound. Involucre none. Involucels of few narrow bractlets. Fruit subglobose, not constricted at the commissure; calyx-teeth conspicuous; ribs filiform or acutish; oil-tubes solitary in the intervals, a few on the commissure.—Species 2, Mediterranean region (Europe, Asia and Africa). (Ancient Latin name, perhaps from Greek koris, bug, by reason of the odor of the leaves.)

1. **C. sativum** L. CORIANDER. One to 2½ feet high; leaflets of lower leaves roundish or ovate, cleft and toothed, ½ to 1¼ inches long; divisions of upper leaves linear, 2 to 4 lines long; fruit 1¾ lines long.

European cultivated plant, escaped from cultivation about settlements. July-Sept.

Locs.—Truckee, *Sonne;* Los Angeles (Erythea 1:59); Anaheim, *Alice King;* San Diego, *T. Brandegee.*

Refs.—CORIANDRUM SATIVUM L. Sp. Pl. 256 (1753), type Italian; Jepson, Man. 706 (1925).

5. **APIUM** L.

Ours erect glabrous biennials with fibrous roots and pinnate leaves. Stems tri- or di-chotomously branched, forming a paniculate inflorescence, the compound umbels opposite the leaves, terminal on the branches or subsessile in the forks. Involucre and involucels small or none, or the former sometimes foliaceous. Flowers white. Calyx-teeth obsolete. Fruit elliptic-ovate or broader than long. Ribs prominent, obtuse, equal. Oil-tubes solitary in the intervals, 2 on the commissure. Seed-face plane.—Species about 11, all continents. (Old Latin name of Parsley.)

1. **A. graveolens** L. COMMON CELERY. Stems 2 to 4 feet high; lower leaves long-petioled, the leaflets 5 (or 7 or 9), 1 to 3 inches long and as broad or broader, coarsely toothed and 3-cleft or even 3-divided; upper leaves on short petioles or sessile, the leaflets 3; rays 4 to 12 lines long; fruit ¼ to ½ line long.

European garden plant, naturalized in marshes or along streams in the valleys, 5 to 1500 feet. June-July.

Locs.—Ramona, *T. Brandegee;* Riverside, *Hall;* San Bernardino, *Parish;* Claremont, *Chandler;* Los Angeles (Erythea 1:59); Carmel River, *Jepson* 14,211; South Berkeley, *Davy;* Suisun Marshes. *Jepson* 14,210.

Refs.—APIUM GRAVEOLENS L. Sp. Pl. 264 (1753), type European; Parish, Zoe 1:9 (1890); Jepson, Fl. W. Mid. Cal. 350 (1901), ed. 2, 295 (1911), Man. 706 (1925).

6. **APIASTRUM** Nutt.

Small branching glabrous annual with dissected leaves. Flowers small, white, in irregularly compound umbels. Rays and pedicels unequal. Involucre and involucels none. Calyx-teeth wanting. Fruit somewhat laterally compressed, elliptic-cordate, more or less tuberculate. Oil-tubes solitary in the intervals, 2 on the commissure. Seed-face narrowly concave.—Species 2, North America. (Apium, Parsley, and aster, Latin suffix meaning wild.)

1. **A. angustifolium** Nutt. MOCK PARSLEY. Erect, di- or tri-chotomously branched from the base, 4 to 8 (or 15) inches high; leaves opposite below, twice or thrice ternately dissected into linear segments ½ to 1 inch long; umbels sessile in the forks or opposite the upper leaves, consisting of 2 or 3 umbellets borne on unequal rays (1 inch long or less), and of 1 or 2 usually sessile or sometimes pediceled flowers in the center; umbellets 3 or 4-flowered, the pedicels unequal (4½ lines long or less) or 1 flower sessile; fruit cordate, broader than high, ½ line long, papillate-roughened all over; ribs inconspicuous.

Dry hill slopes or sandy valleys, 400 to 2800 feet: Sierra Nevada foothills from Sacramento Co. to Calaveras Co.; Coast Ranges from Lake Co. to San Luis Obispo Co.; cismontane Southern California. South to Lower California. Mar.-Apr.

Locs.—Sierra Nevada: Folsom, *K. Brandegee;* Comanche, Amador Co., *Hansen;* betw. Valley Sprs. and Mokelumne Hill, *F. E. Blaisdell.* Coast Ranges: Alder Sprs., w. Glenn Co., *Heller* 11,445; Hough's Sprs., n. Lake Co., *Jepson* 9020; Vaca Mts., *Jepson* 14,207; Conn Valley, Napa Range, *Jepson* 14,208; Mt. Diablo, *Rattan;* Mt. Tamalpais, *K. Brandegee;* Eva sta., Santa Cruz Mts., *Jepson* 14,206; Pajaro Hills, n. Monterey Co., *Chandler* 420; Milpitas Ranch, Santa Lucia Mts., *Eastwood;* Alcalde, *Eastwood;* Los Osos Valley, San Luis Obispo Co., *Condit.* S. Cal.: Sycamore Cañon, Santa Inez Mts., *Jepson* 9163; Henniger Flats, San Gabriel Mts., *Peirson* 133; Garvanza, *Braunton;* San Bernardino, *Parish;* Santa Catalina Isl., *Gambel;* Elsinore, *McClatchie;* Pala Mission, *Jepson* 8497; Wagon Wash near Sentenac Cañon, e. San Diego Co., *Jepson* 8770; Cajon Hills, w. San Diego Co., *Dunn.*

Refs.—APIASTRUM ANGUSTIFOLIUM Nutt.; T. & G. Fl. 1:644 (1840), type loc. San Diego, *Nuttall;* Jepson, Fl. W. Mid. Cal. 349 (1901), ed. 2, 294 (1911), Man. 704, fig. 684 (1925).

7. **AMMOSELINUM** T. & G.

Low annuals. Leaves ternately divided into small segments. Umbels compound, with unequal rays, small, sessile or shortly peduncled. Involucre and involucels present. Flowers white. Calyx-teeth obsolete. Fruit ovate to ovate-oblong, compressed laterally. Ribs prominent, equal, more or less scabrous, the laterals of the companion carpels closely approximate, as if forming a single broad rib. Styles short. Oil-tubes solitary in the intervals, 2 on the commissure.—Species 3, southwestern United States. (Greek ammos, sand, and Selinum, an Old World genus of Umbelliferae, the name derived from selinon, the Greek word for parsley.)

1. **A. giganteum** C. & R. Plants 5 to 8 inches high; stems leafy; herbage glabrous or the upper portion of the stems and the margins of the upper leaves scaberulous; leaves 1 to 2 inches long, the blades 2 to 3 times ternately dissected into linear segments 1 to 3 lines long; peduncles 1 to 2⅜ inches long; rays 1 to 5 lines long; fruits 1½ to 2½ lines long, densely scabrous with short-lanceolate or short-subulate processes.

Heavy soil of desert flats, 500 feet: Chuckwalla Valley, Colorado Desert. East to Arizona. Apr.

Tax. note.—This species has been collected in California only at Hayfields (*Munz & Keck* 4930). Further collections are desirable, more especially specimens in ripe fruit. The lanceolate spines characteristic of the ovary in the flowering or half-grown stages in the specimens from Hayfields seem essentially like those of the mature fruits in the type specimens of A. giganteum gathered by Pringle in Arizona. They are denser, but after the ovary grows to maturity and becomes twice as large, the spines would, inevitably we should think, be spaced about as in the type of A. giganteum.

Refs.—AMMOSELINUM GIGANTEUM C. & R. Contrib. U. S. Nat. Herb. 7:89 (1900), type loc. Phoenix, Ariz., *Pringle* 28. *A. occidentale* M. & J. Bull. Torr. Club 52:224 (1925), type loc. Hayfields, Chuckwalla Valley, Colorado Desert, *Munz & Keck* 4930.

8. **AMMI** L.

Erect branching glabrous biennials with slightly fusiform roots and dissected decompound leaves. Flowers white, in compound umbels. Bracts parted into filiform segments, reflexed. Bractlets lanceolate, acuminate, spreading or reflexed. Calyx-teeth obsolete. Fruit ovoid, very slightly flattened laterally. Ribs filiform. Oil-tubes solitary in the intervals and 2 on the commissure.—Species 7, Europe, Asia and Africa. (Greek name of an umbelliferous plant.)

Leaf-segments obovate to oblong or oblanceolate, serrate or laciniate; fruiting rays spreading...... 1. *A. majus.*
Leaf-segments filiform or narrowly linear, entire; fruiting rays closely contracted....2. *A. visnaga.*

1. **A. majus** L. BISHOP'S WEED. Stem slender, branching above, 1¼ to 2½ feet high; basal and lower leaves simply pinnate with 7 or 5 (or 3) obovate to oblong serrate leaflets ¾ to 3 inches long; upper leaves biternate or ternate-pinnate, the divisions narrowly oblanceolate, acute, laciniate or serrulate, especially at apex, about ½ to 2 inches long; rays about 25 to 30, little unequal, ¾ to 3 inches long; pedicels 1 to 1½ lines long; bracts linear below, parted above into 3 filiform

divisions; bractlets lanceolate, acuminate, entire, scarious-margined at base; fruit less than 1 line long; carpels with concave face; oil-tubes solitary in the intervals, 2 on the commissure.

Low valley lands, 5 to 100 feet: European weed, naturalized in Napa Valley. June-Aug.

Locs.—Union sta., *Jepson* 7435 in 1917; Salvador School, *Jepson* 9066 in 1920; Yountville, *Jepson* 14,204 in 1893.

Refs.—AMMI MAJUS L. Sp. Pl. 243 (1753); Jepson, Fl. W. Mid. Cal. 352 (1901), ed. 2, 296 (1911), Man. 707 (1925).

2. **A. visnaga** Lam. TOOTHPICK WEED. Stouter, ⅓ to 2¾ feet high; leaves tri-ternately dissected into filiform segments 3 to 6 lines long; fruiting umbels and umbellets contracted; fruit about 1 line long.

Valley flats, 400 feet, naturalized from Europe: Santa Clara Valley. July-Sept., fr. Oct.

Introduction note.—This species was collected at Saratoga in September, 1893 (*Davy* 248) and must, therefore, have been introduced prior thereto. Collected again in 1912 (*Jepson* 5156) and yet again in 1920 (*H. A. Dutton*), its slow spread has, apparently, been confined essentially to one locality.

Refs.—AMMI VISNAGA Lam. Fl. Fr. 3:462 (1778); Jepson, Man. 707 (1925). *Daucus visnaga* L. Sp. Pl. 242 (1753), type south European.

9. CARUM L.

Ours erect and slender glabrous biennials or perennials. Leaves or their ternate divisions simply pinnate, rarely bipinnate; leaflets few, linear and entire, or ovate or oblong and serrate. Flowers white, in compound umbels. Involucre of entire bracts or none. Involucels of entire bractlets. Calyx-teeth small. Stylopodium conical. Fruit ovate or oblong, somewhat laterally compressed, with filiform or salient ribs. Oil-tubes solitary in the intervals, 2 to 6 on the commissure.—Species 22, North America, Europe, Asia and Africa. (Karon, Greek name of the Caraway.)

Leaflets linear; involucre none or of 1 or 2 small linear-setaceous bracts; ribs filiform.
    Stems clustered, arising from a fascicle of coarse roots; involucre inconspicuous, of 1 or 2 small bracts or none; styles short........1. *C. kelloggii.*
    Stems solitary, arising from a tuber or cluster of tubers; styles long.
        Fruit about 1 line long; Sierra Nevada and coastal; common........2. *C. gairdneri.*
        Fruit 1½ to 2 lines long; Siskiyou Co.; rare........3. *C. oreganum.*
Leaflets ovate to oblong; stems solitary, from a tuber or a cluster of tubers; bracts of the involucre about 12 to 15, lanceolate, at length reflexed; ribs salient........4. *C. howellii.*

1. **C. kelloggii** Gray. DOBIE SPINDLE-ROOT. Stems several from a fascicle of coarse and hard fibrous roots, 3 to 5 feet high; basal leaves 5 to 10 inches long, ternate, each division pinnate with narrowly linear divisions 3 to 4 inches long; cauline leaves similar but smaller; involucral bracts and involucel bractlets several, lanceolate or subulate; rays ¾ to 1½ inches long; stylopodium very large, with short stout styles; carpels frequently unequal or only one maturing.

Adobe or clay soil of open foothills or low valley flats, 300 to 2400 feet: Coast Ranges from Santa Clara Co. to Humboldt Co.; Sierra Nevada from Mariposa Co. to Shasta Co. July-Aug.

Geog. note.—Although Carum kelloggii has a wide distribution in the foothills of northern California it is much localized in occurrence and usually forms colonies of restricted area on the heaviest hillside adobe,—adobe which is water-saturated in the rainy season. Likewise, similar habitats on flats, that is, bolsas or shallow evanescent rain-lakes, present highly favorable conditions for it. On the flat of lower Conn Valley in the Napa Range it is the dominant over fifty-acres and in places nearly pure (*Jepson* 6252).

The coarse thickened roots which form the fascicle beneath the stem base in Carum kelloggii are slenderly fusiform, 1 to 2¼ lines thick and about 9 to 12 (or 15) lines long; they contract gradually downward into a cord-like prolongation. These cord-like roots at a depth of 3 to 9 inches sometimes develop tubers 2 to 3 lines thick and 2½ to 11 lines long. These tubers are rather abruptly contracted below into a cord-like root. Since this species inhabits soil which desiccates or cracks deeply in summer, such deep-seating of the tubers is important in conserving the plant during the long drought period. It is probable that multiplication also results from this habit.

Locs.—Coast Ranges: Pt. Joe, Monterey, *Jepson* 9743a; Los Gatos, *Heller* 7535; Oakland Hills, *Jepson* 14,216; Pt. Reyes hills, *Jepson* 1168; Fairfax Manor, Marin Co., *Jepson* 9490; Vacaville, *Jepson* 14,213; Howell Mt., *Jepson;* Grasshopper Peak, Bull Creek, Humboldt Co., *Jepson* 16,488; Alton, Humboldt Co., *Tracy* 3999; Trinity Center, Trinity Co., *Lorenzen;* Redding, *Blankinship.* Sierra Nevada: Hamilton sta., Mariposa Co., *Lemmon;* Avena sta., c. San Joaquin Co., *Sanford;* New York Falls, Amador Co., *Hansen* 72; Ione, *Braunton* 1138; Shingle Sprs., Eldorado Co., *Kennedy;* Chico (e. of), *H. A. Dutton.*

Refs.—CARUM KELLOGGII Gray, Proc. Am. Acad. 7:344 (1868), based on spms. from San Jose, *Brewer* 832, Oakland, *Bolander,* and Bolinas, *Kellogg;* Jepson, Fl. W. Mid. Cal. 352 (1901), ed. 2, 296 (1911), Man. 707, fig. 687 (1925). *Ataenia kelloggii* Greene, Pitt. 1:274 (1889).

2. **C. gairdneri** Gray. SQUAW-ROOT. Stem solitary, 1 to 3⅓ feet high, from a tuberous root or a fascicle of such; leaves few, simply pinnate, the leaflets 3 to 7 (or 9), linear, 2 to 4 inches long; upper leaves mostly simple; flowering rays 3 to 6 lines long, in fruit about twice as long; involucre of 1 or 2 linear acute bracts or none; involucels of few linear acuminate bractlets; fruit broadly oblong to elliptic or ovatish, 1 to 1½ (or 2) lines long; stylopodium low, with long slender styles.

Adobe flats or meadows or open hills: Coast Ranges from San Luis Obispo Co. to Siskiyou Co., 10 to 4000 feet; Sierra Nevada from Tulare Co. to Lassen Co., 3000 to 7000 feet. East to Colorado, north to British Columbia. July-Sept.

Field note.—Carum gairdneri is sometimes so abundant as to whiten, in its flowering time, the meadows in the northern Sierra Nevada. In the Coast Ranges it and Carum kelloggii sometimes grow in close association, as on open slopes of Howell Mt. in the Napa Range. As there observed Carum gairdneri has clear white corollas, a flat-topped umbel with the umbellets contracting in fruit or closing up, while the corolla in C. kelloggii is dull white or sordid, the umbel convex and the umbellets spreading in fruit.

Locs.—Coast Ranges: San Luis Obispo, *Condit;* Cypress Point, Monterey, *Jepson* 14,219; Oakland Hills, *Jepson* 14,221; Lake Lagunitas, Marin Co., *Jepson* 9498; Howell Mt., *Jepson* 1726; Ukiah, *S. M. Barrett;* Elk Mt., n. Lake Co., *Tracy* 2342; Eureka, *Tracy* 969; Sisson, *Jepson* 14,220; Yreka, *Butler* 925. Sierra Nevada: Little Tule River, *Purpus* 5632; Kelty Mdw., Madera Co., *Kennedy;* Eagle Creek, Tuolumne Co., *A. L. Grant* 494; Kennedy Mdw., Tuolumne Co., *A. L. Grant* 461; Duffield Cañon, Soulsbyville, *Jepson* 7689; Dorrington, Calaveras Co., *Jepson* 10,120; Riverton, Eldorado Co., *K. Brandegee;* Truckee, *Sonne;* Lake Independence, *Jepson* 8068; Sierra Valley, *Jepson* 8041; Butte Mdws., *Heller* 11,649; Martin Sprs., Eagle Lake, *Brown & Wieslander* 15; Big Valley, Lassen Co., *M. S. Baker.*

Refs.—CARUM GAIRDNERI Gray, Proc. Am. Acad. 7:344 (1868); Jepson, Fl. W. Mid. Cal. 352 (1901), ed. 2, 296 (1911), Man. 708, fig. 688 (1925). *Ataenia gairdneri* H. & A. Bot. Beech. 349 (1840), type from Cal., *Douglas.*

3. **C. oreganum** Wats. SQUAW POTATO. Resembling no. 2; leaves more divided with shorter leaflets; bractlets lanceolate to ovate-lanceolate, scarious; fruit 1½ to 2 lines long; seed sulcate beneath the oil-tubes.

Wet meadows or wet rocky slopes, 4000 to 5000 feet: Mt. Shasta (Contrib. U. S. Nat. Herb. 7:105). North to British Columbia. June-Aug.

Refs.—CARUM OREGANUM Wats. Proc. Am. Acad. 20:368 (1885), type loc. Wappatoo Isl., Ore., *Nuttall;* Jepson, Man. 708 (1925). *Ataenia oregana* Greene, Pitt. 1:274 (1889).

4. **C. howellii** C. & R. MEADOW SPINDLE-ROOT. Stem stoutish, 2½ to 4½ feet high, arising from a heavy cluster of very stout very fibrous fusiform roots; leaves bipinnate, mostly lanceolate in outline; leaflets crowded, broadly oblong to ovate, acute, coarsely but sparingly serrate or sparingly incised, ¾ to 1¾ inches long; rays 16 to 40, ¾ to 2¾ inches long in fruit; pedicels 2 to 5 lines long; bracts several, narrowly lanceolate, reflexed, 8 to 12 lines long; bractlets similar, mostly reflexed, nearly as long as the pedicels, scarious-margined; fruit 2 lines long; ribs thick-based, acute.

Moist meadows, 2000 to 4500 feet: Sierra Nevada from Mariposa Co. to Nevada Co.; Coast Ranges from Mendocino Co. to Siskiyou Co. North to Oregon. July.

Locs.—Mariposa Co., *Congdon* (Westfalls Mdw., Wawona and Darrah); Bear Valley, Nevada Co., *Jepson* 14,222; Long Valley, Mendocino Co., *C. S. Myszka;* Murphy Mdw., Bald Mt., Humboldt Co., *Tracy* 4832; Sisson, Siskiyou Co., *Jepson* 6157; Quartz Valley, Siskiyou Co., *Butler* 1831.

Refs.—CARUM HOWELLII C. & R. Rev. N. A. Umbell. 129 (1888), type loc. Grants Pass, Ore., *Howell* 710; Jepson, Man. 708, fig. 689 (1925). *Ataenia howellii* Greene, Pitt. 1:274 (1889). *Taeniopleurum howellii* C. & R. Bot. Gaz. 14:284 (1889); Contrib. U. S. Nat. Herb. 7:102, fig. 26 (1900).

10. EULOPHUS Nutt.

Glabrous erect perennials with deep-seated fascicled tubers, the leaves all basal or the cauline few and small. Leaves compound with the terminal segments or leaflets often differing markedly from the lateral ones; lateral leaflets linear and entire, rarely ovate or oblong and incised; terminal leaflet elongated, always entire and often caudate. Flowers white or pinkish. Umbels compound, long-peduncled. Bracts of involucre and bractlets of involucel similar, several, lanceolate to obovate, acuminate. Calyx-teeth prominent. Fruit ovate to linear-oblong, flattened laterally. Ribs filiform, equal. Stylopodium conical, with long strongly recurved or deflexed styles. Oil-tubes 1 to 5 in the intervals, 4 to 8 on the commissure. Seed-face broadly concave, with a central longitudinal ridge.—Species 5, North America. (Greek eu, true, and lophus, crest, in reference to the salient terminal leaflet.)

Terminal leaflet commonly much longer than the lateral ones.
  Rachis of the leaves not dilated.
    Oil-tubes solitary in the intervals; fruit 3 to 4 lines long........................1. *E. californicus.*
    Oil-tubes more than one in the intervals (as also in nos. 3 to 5); fruit 2 lines long.......... 2. E. *bolanderi.*
  Rachis of the leaves dilated, the segments few and mostly short..........................3. *E. pringlei.*
Terminal leaflet similar to the lateral ones; leaflets 1 to 3 inches long.
  Bractlets narrowly lanceolate..4. *E. parishii.*
  Bractlets ovate, cuspidate..5. *E. cuspidatus.*

1. **E. californicus** C. & R. Stems generally 1 to 3, 3 to 5 feet high; leaves basal, twice or thrice ternate, then pinnate or pinnately divided, the segments or leaflets ovate, 3 to 7 lines long, incised or serrate, the terminal leaflets linear-elongated, entire, ½ to 2 inches long; fruiting rays 1 to 2¾ inches long; fruit linear-oblong, 3 to 4 lines long; oil-tubes large, solitary in the intervals, sometimes an extra one in one of the intervals, 4 on the commissure.

Along water courses, 300 to 2000 feet: Sierra Nevada foothills from Stanislaus Co. to Mariposa Co.; Mt. Hamilton Range. Apr., fr. June.

Locs.—White's Gulch, Mariposa Co., *Congdon;* Arroyo Hondo, Mt. Day, *R. J. Smith.*

Var. **sanctorum** Jepson. Lateral segments narrower, disposed to be unilaterally or unequally lobed.—Southern Monterey Co.

Refs.—EULOPHUS CALIFORNICUS C. & R. Rev. N. A. Umbell. 114 (1888); Jepson, Fl. W. Mid. Cal. ed. 2, 297 (1911), Man. 709, fig. 690 (1925). *Chaerophyllum* (?) *californicum* Torr. Pac. R. Rep. 4:93 (1857), type loc. Knight's Ferry, Stanislaus Co., *Bigelow.* Var. SANCTORUM Jepson, Madroño 1:130 (1923), type loc. San Carpoforo, s. Monterey Co., *Condit;* Man. 709 (1925).

2. **E. bolanderi** C. & R. Plants 1 to 2 feet high; tubers 1 to 8, obfusiform or oblong; herbage glabrous; leaves once, twice or thrice ternately divided into oblong or linear segments 1 to 3 (or 5) lines long, or the terminal segments of the divisions elongated-linear and ½ to 3 inches long; fruiting rays 4 to 10 lines long; pedicels 1½ to 2 lines long; bracts few, lanceolate, scarious, or none; bractlets several, narrowly to ovate-lanceolate, abruptly acuminate, scarious, rather shorter or sometimes longer than the pedicels; fruit oblong, 2 lines long; oil-tubes minute, 2 to 5 in the intervals, 6 on the commissure.

Wet meadows, 4500 to 9000 feet: Sierra Nevada from Tulare Co. to Modoc Co.; Yollo Bolly Mts. North to Idaho. June-July, fr. Aug.-Sept.

Leaf variation.—In the typical form the usually crowded lateral divisions or leaflets are oblong or linear and about 1 to 2 or 3 lines long, while the terminal segments are elongated-linear and 1 to 3 inches long. The leaflets are thus to some degree dimorphic in size and position and to some extent in shape. This typical form is represented by the following: betw. Cedar Creek and Colony Mill, North Fork Kaweah River, *Jepson* 654; Mt. Silliman, *Jepson* 735; Chilnualna Falls, Mariposa Co., *Congdon*; Yosemite, *Congdon*; Battle Creek Mdws., Tehama Co., *J. Grinnell*; Hot Springs Valley, Lassen Peak, *Jepson* 4100. Yet, one as frequently finds plants with the ultimate divisions much alike or in any event not evidently dimorphic. This form is represented by the following: Hackberry Cañon, Caliente, *K. Brandegee*; Piute Peak, Kern Co., *Purpus* 5293; Little Kern River near Deep Creek, *Jepson* 4915; Conness Creek, Tuolumne River, *Jepson* 3365; Boca, *Curran*; Portola, Plumas Co., *K. Brandegee*; Ft. Bidwell, *Manning*; Bald Mt., ne. Shasta Co., *Hall & Babcock* 4257; South Yollo Bolly, *Jepson* 14,259.

Var. **benignus** Jepson. Leaflets filiform-linear, 1 to 2 inches long, all essentially alike; oil-tubes 1 or 2 in some of the dorsal intervals, the others with none or with minute ones; commissure deeply channeled, with 2 oil-tubes or with minute ones in a continuous thin layer.—Hetch-Hetchy.

Refs.—EULOPHUS BOLANDERI C. & R. Rev. N. Am. Umbell. 112 (1888); Jepson, Man. 709 (1925). *Podosciadium bolanderi* Gray, Proc. Am. Acad. 7:346 (1868), type loc. Mariposa Trail, Yosemite, *Bolander*. Var. BENIGNUS Jepson, Madroño 1:130 (1923), type loc. Hetch-Hetchy, *A. L. Grant* 870.

3. **E. pringlei** C. & R. Stem 1 to 1½ feet high; leaves pinnately compound with broad inflated midrib, the primary divisions once or twice pinnately divided into few linear-filiform or linear-subulate segments 1 to 6 lines long, the terminal segment 2 to 10 lines long; rays 5 to 10, ½ to 1½ inches long; pedicels 1 to 2 lines long; involucre of 1 or 2 very small bracts; involucels of several subscarious lanceolate bractlets 1 to 2 lines long; fruit oblong, 2 to 2½ lines long; oil-tubes 3 to 5 in the intervals, 8 on the commissure.

Hills and valleys, 1000 to 3000 feet: inner region from San Luis Obispo Co. to northern Los Angeles Co. May-June, fr. Aug.

Locs.—Chalcedony Hill, San Luis Obispo Co., *Summers*; Antelope Valley, *Davidson*; Harold, Los Angeles Co., *Davidson*; Acton, Los Angeles Co., *Davidson*.

Refs.—EULOPHUS PRINGLEI C. & R. Rev. N. Am. Umbell. 113 (1888), type from Cal., *Pringle* 40; Jepson, Man. 709 (1925).

4. **E. parishii** C. & R. Stem usually very slender, ⅔ to 1¼ (or 2½) feet high; tubers 1 to 3, fusiform; leaves ternate, sometimes biternate; leaflets narrowly linear to narrowly lanceolate, 1 to 3 or 4½ inches long, the terminal sometimes distant; uppermost leaves simple, bract-like; rays 5 to 22, 4 to 7 or 11 lines long in fruit; pedicels 1 to 2 lines long; involucre none or scanty; bractlets 2 to 6, narrowly lanceolate, 2 lines long; fruit oblong to ovate, 1 to 1½ lines long; oil-tubes 2 to 5 in the intervals, 6 on the commissure.

Wet meadows and springy slopes, 5800 to 8000 feet: mountains of Southern California; Sierra Nevada from Tulare Co. to Eldorado Co. July-Aug., fr. Sept.-Oct.

Locs.—S. Cal.: Cuyamaca, *T. Brandegee* (very stout); Deer Sprs., Mt. San Jacinto, *C. V. Meyer* 545; Bear Valley, San Bernardino Mts., *Parish* 3171. Sierra Nevada: Hockett Mdw., Tulare Co., *Culbertson* 4450; Poison Mdw., Soda Cañon, upper Kern River, *Jepson* 1116; Markwood Mdw., Fresno Co., *Jepson* 16,045; Silver Creek, Eldorado Co., *Kennedy* 163. This species often whitens in July and August many acres of the swampy meadows in the Sierra Nevada. It is probably very common but definite recognition of a particular station must needs wait in each case on mature fruit or until our knowledge of the flowering stage is more precise.

Refs.—EULOPHUS PARISHII C. & R. Rev. N. Am. Umbell. 112 (1888); Jepson, Man. 709 (1925). *Pimpinella parishii* C. & R. Bot. Gaz. 12:157 (1887), type loc. Bear Valley, San Bernardino Mts., *S. B. & W. F. Parish* 987. *E. simplex* C. & R. Contrib. U. S. Nat. Herb. 7:112 (1900). *E. pringlei* var. *simplex* C. & R. Rev. N. Am. Umbell. 113 (1888), type loc. Sierra Co., *Lemmon*. *Carum gairdneri* var. *latifolium* Gray, Proc. Am. Acad. 7:344 (1868), type loc. Sierra Co., *Lemmon*.

5. **E. cuspidatus** Jepson. Stem slender, 6 to 9 inches high, sparingly branched; leaves bipinnately divided into few linear divisions; rays 6 to 10, 2 to 5 lines long;

pedicels 1 to 2 lines long; bracts 4 to 6, obovate, membranous, erosulate at the truncatish or obtuse apex, 2 lines long, tipped by a bristle 1 to 1½ lines long; fruit (immature) ovate, obscurely short-beaked, 1½ lines long.

Foothills, 2000 to 2500 feet: Calaveras Co. (Mountain Ranch). May.

Refs.—EULOPHUS CUSPIDATUS Jepson, Madroño 1:133 (1923), type loc. Table Hills near Mountain Ranch, Calaveras Co., *Davy* 1618; Jepson, Man. 710 (1925).

11. **LIGUSTICUM** L. LOVAGE

Perennial herbs with large aromatic roots. Herbage glabrous. Leaves bi- or tri-ternate in ours, with pinnate divisions. Flowers white or pinkish, in many-rayed compound umbels. Involucre none. Involucels of narrow bractlets. Calyx-teeth small or obsolete. Fruit oblong or ovate, a little flattened laterally. Ribs prominent, acute or slightly winged, equal. Oil-tubes mostly 3 to 5 in the broad intervals, 6 to 10 on the commissure.—Species about 45, Europe, Asia, north Africa, New Zealand, Chile and North America. (Name derived from Liguria, a province of Italy, where Lovage, Ligusticum levisticum L., is endemic.)

Stems more or less leafy; rays and leaf-margins scaberulous; coastal........................1. *L. apiodorum.*
Stems not leafy or with 1 reduced leaf; rays and leaf-margins not scabrous; montane....2. *L. grayi.*

1. **L. apiodorum** C. & R. WOOD LOVAGE. Stems more or less leafy, 2 to 3 (or 6) feet high; rays and the margins of the leaflets and commonly the peduncles and the nerves of the leaflets scaberulous; leaves uni-, bi- or partly tri-ternate, then the divisions pinnate with 3 or 5 leaflets; leaflets broadly ovate in outline, laciniately pinnatifid, ½ to 2 inches long; fruiting rays ¾ to 1 (or 1½) inches long; bractlets linear-setaceous, few or none; fruit broadly oblong, 1½ to 2 lines long, the ribs very sharp; oil-tubes 4 or 5 in the dorsal intervals, 5 or 6 in the lateral ones, 6 to 8 on the commissure.

Rocky or brushy hills, 5 to 2500 feet: coastal region from San Mateo Co. to Del Norte Co. June, fr. Aug.

Locs.—San Mateo, *Elmer* 4803; Bay View Hills, San Francisco, *E. Cannon;* Pt. Reyes, *Davy* 6766; Kenwood, Sonoma Co., *Blasdale;* Eureka, *Tracy* 971; Dinsmore Ranch, Van Duzen River valley, *Tracy* 3970; Hupa road near Redwood Creek, *Jepson* 1959; Trinidad, *Tracy* 6820; Gilbert Creek, Del Norte Co., *Jepson* 9356.

Refs.—LIGUSTICUM APIODORUM C. & R. Contrib. U. S. Nat. Herb. 7:132 (1900); Jepson, Man. 713, fig. 695 (1925). *Pimpinella apiodora* Gray, Proc. Am. Acad. 7:345 (1868), type loc. rocky hills, Mendocino coast, *Bolander* (first locality cited); Jepson, Fl. W. Mid. Cal. 353 (1901), ed. 2, 297 (1911).

2. **L. grayi** C. & R. SHEEP LOVAGE. Plants 1 to 2½ feet high, glabrous, the stems 1 or 2 from a stout fibrous-coated caudex, not leafy or with one much reduced leaf; leaves basal, once or twice ternate, then pinnate with 5 or 7 leaflets, the leaflets ovate in outline, incised, parted or divided, ½ to 1¼ inches long; flowers white; bractlets linear-setaceous, few or none; fruiting rays 1 to 2½ inches long; pedicels 2 to 3 lines long; fruit 2 lines long, the ribs very narrowly winged; oil-tubes 3 to 6 in the intervals, 4 to 8 on the commissure.

Montane slopes or meadows, 4000 to 10,200 feet: Sierra Nevada from Tulare Co. to Modoc Co.; inner North Coast Range from Trinity Co. to Siskiyou Co. July-Aug., fr. Aug.-Sept.

Locs.—Sierra Nevada: Farewell Gap, *Jepson* 1149; Mineral King, *Jepson* 1033; Mt. Silliman, *K. Brandegee;* Chilnualna Creek, *Congdon;* Peregoy Mdw., Yosemite, *Jepson* 5640a; Rodgers Lake to Muir Lake, *Jepson* 3386; Piute Mt., Tuolumne Co., *Jepson* 4582; Soda Springs Cañon, Kennedy Lake, *A. L. Grant* 472; Stanislaus Peak, *A. L. Grant* 530; Big Mdws., Calaveras Co., *Jepson* 10,087; Ebbetts Pass, Alpine Co., *Brewer* 2082; Silver Creek, Eldorado Co., *Kennedy* 21; Mt. Tallac, *Jepson* 8155; Deer Park, Placer Co., *C. J. Fox;* Summit sta., Nevada Co., *Jepson* 14,243; Pioneer road sta., North Fork Yuba River, *Jepson* 16,838; Mill Creek Mdw., Warner Mts., *L. S. Smith* 985; Mt. Bidwell, *Jepson* 7884. Inner North Coast Range: South Yollo Bolly, *Jepson* 14,244; Shackelford Creek, near Quartz Valley, *Butler* 459.

Refs.—LIGUSTICUM GRAYI C. & R. Rev. N. Am. Umbell. 88 (1888), based on *L. apiifolium* var. *minus* Gray; B. & W. Bot. Cal. 1:264 (1876), type loc. Ostrander's Mdws., near Yosemite, *Bolander* 6341, and Ebbetts Pass, Alpine Co., *Brewer* 2082; Jepson, Man. 713, fig. 696 (1925). *L. cusickii* C. & R. Contrib. U. S. Nat. Herb. 7:138 (1900), type loc. higher mts. of e. Ore., *Cusick* 1799. *L. pringlei* C. & R. l.c., type loc. Siskiyou Co., *Pringle* 19.

12. **PODISTERA** Wats.

Dwarf perennials, the stems short and shortly branched, forming a mat-like plant. Leaves once or twice pinnately parted. Umbels compound but very much condensed. Involucre none. Involucels of 3 to 5-cleft green bractlets. Flowers white or pinkish. Calyx-teeth prominent. Styles ribbon-like. Fruit flattened laterally, elliptic-ovate. Ribs slender. Oil-tubes 2 or 3 in the intervals, 6 on the commissure.—Species 2, California. (Greek podos, foot, and stereos, solid, referring to the compactly involved pedicels and involucels.)

Leaves pinnately parted........................1. *P. nevadensis.*
Leaves bipinnately parted........................2. *P. albensis.*

1. **P. nevadensis** Wats. Peduncles arising from the short crowded branches, ¾ to 1½ inches high; herbage obscurely puberulent; leaves pinnately parted, 4 to 9 lines long, the 5 to 7 segments narrowly oblong, acute, entire, 1 to 3 lines long, the petioles with membranous sheaths; flowers yellow; umbels very much condensed; fruit 1 to 1¼ lines long.

Alpine summits, 11,600 to 13,000 feet: Sierra Nevada in Tuolumne and Mono Cos. July.

Field note.—Podistera nevadensis is an inhabitant of the high peaks and slopes of the easterly crests of the Sierra Nevada in Tuolumne and Mono counties: Mt. Gibbs, Mt. Dana (*Jepson* 3291) and Mt. Warren (*Congdon*), mostly within the limits of an 800-foot zone. The plants form closely woven circular mats often one foot in diameter, with the flowers scarcely rising above the foliage. It is also reported from Sugarloaf in the San Bernardino Mts. (Ann. Mo. Bot. Gard. 17:254).

Refs.—PODISTERA NEVADENSIS Wats. Proc. Am. Acad. 22:475 (1887); Jepson, Man. 714 (1925). *Cymopterus nevadensis* Gray, Proc. Am. Acad. 6:536 (1865), type loc. Mt. Dana, *Brewer.*

2. **P. albensis** Jepson. Similar to no. 1; plants 1 to 2¼ inches high; leaves bipinnatifid, the oblong segments 1 to 2 lines long.

Rocky slopes, 7000 to 8000 feet: White Mts.

Refs.—PODISTERA ALBENSIS Jepson, Madroño 1:140 (1923), type loc. White Mts., *Purpus* 5831; Jepson, Man. 714 (1925).

13. **OREONANA** Jepson

Low tufted grayish plants, the peduncles and leaves from the crown of a stout taproot. Herbage woolly or roughish-pubescent. Leaves ternately compound and finely dissected, the segments crowded, callous-margined and cuspidate. Flowers white, in compound umbels, the umbels much condensed or capitate. Rays about 10 to 15. Calyx-teeth present, often conspicuous. Involucre none. Involucels unilateral. Fruit broadly elliptic or orbicular, somewhat laterally compressed, sessile. Ribs filiform. Sterile flowers on filament-like pedicels which are longer than the rays. Oil-tubes 3 to 5 in the intervals, 3 or 4 or 6 on the commissure.—Species 2, California. (Greek oreos, mountain, and nannos, dwarf, these plants very small as compared with the Velaeas from which they are separated.)

Rays membranously winged and web-footed; sterile pedicels equaling or little exceeding the fruit; calyx-teeth of sterile flowers very conspicuous, star-like........................1. *O. clementis.*
Rays not winged; sterile pedicels greatly exceeding the fruit; calyx-teeth inconspicuous........................2. *O. vestita.*

1. **O. clementis** Jepson. PIGMY PARSNIP. Plants 1 to 3 inches high; peduncles ascending, from the scaly winter-buds of the root-crown; blades, pedicels and fruits

with a short stiff spreading pubescence, the plant otherwise glabrous; peduncles equaling or little exceeding the leaves; umbel globose-capitate; involucels 5-lobed, the lobes ovate-acuminate; rays membranously winged and web-footed at base, very short (1 to 2 lines long); fruit densely white-pubescent when young, grayish in age, sessile, globose, the calyx-teeth evident; pedicels of sterile flowers equaling or only slightly exceeding the fruit; oil-tubes 3 to 5 in the intervals, 4 (or 3) on the commissure; calyx-teeth of sterile flowers very conspicuous, star-like.

Sandy granite mountain slopes or plateau flats, 6000 to 12,000 feet: southern Sierra Nevada from Kearsarge Pass to the upper Kern River basin. July, fr. Sept.

Tax. note.—The species in this work called Oreonana clementis Jepson (1925) was first proposed as new by M. E. Jones in 1912 (Contrib. W. Bot. 14:33). In that year Jones definitely named this species as a Drudeophytum and published it (l.c.) as such, "Drudeophytum Clementis n. sp." There can, therefore, be no question as to his intent, though he adds the following sentence: "I have named it Pycnothryx Clementis provisionally but put it here [that is in Drudeophytum] for the present until the status of Deweya Hartwegi is fixed, which is the type of the genus." Pycnothryx (1912) is, however, not acceptable as a genus name under the International Rules of Nomenclature, because names published without definite intent are invalid. Moreover, in this case there is also conflict of intention. The author cannot, obviously, refer the species definitely to the genus Drudeophytum and at the same moment in the same paragraph refer it to a proposed new genus Pycnothryx. Since both proposals cannot be right, the first plainly has the greater weight.

Locs.—Kearsarge Pass (Jones, Contrib. W. Bot. 14:34); Harrison Pass, *Jepson* 5036; Mt. Whitney, *K. D. Jones;* mts. betw. Soda Creek and Little Kern River, *Purpus* 1769; Whitney Mdws., *Hall & Babcock* 5469; Ramshaw Mdws., near Kern Peak, *Mary Haskell.*

Refs.—OREONANA CLEMENTIS Jepson, Man. 715, fig. 698 (1925). *Drudeophytum clementis* Jones, Contrib. W. Bot. 14:33 (1912), type loc. Mt. Whitney, *M. S. Clemens. O. californica* Jepson, Madroño 1:140, fig. 26 (1923), type loc. Ramshaw Mdws., Tulare Co., *Jepson* 4966.

2. **O. vestita** Jepson. WOOLLY PARSNIP. Plants 2 to 4 inches high; herbage and inflorescence densely woolly, the wool obscuring the leaf-segments and partially the rays; umbels dense, equaling or mostly raised above the leaves; involucels of lanceolate 3 to 5-lobed bractlets; rays 6 to 10 lines long, not winged; sterile pedicels 4 to 6 lines long, greatly exceeding the fruit; fruit sessile or nearly so, ovate-oblong, soft-pubescent, 2 lines long; oil-tubes 3 or 4 in the intervals, 3 on the commissure; calyx-teeth of sterile flowers evident but not conspicuous.

Mountain slopes or plateaus, 6500 to 10,000 feet: San Gabriel and San Bernardino mountains. June-July, fr. Sept.

Locs.—Summit of Mt. San Antonio, *C. M. Wilder;* summit of North Baldy, *Peirson* 137; Bear Valley, San Bernardino Mts., *Parish.*

Refs.—OREONANA VESTITA Jepson, Madroño 1:141 (1923); Man. 715 (1925). *Deweya vestita* Wats. Proc. Am. Acad. 17:374 (1882), type loc. summit of Mt. San Antonio (Baldy), *S. B. & W. F. Parish;* Wats. l.c. 22:415 (1887). *Velaea vestita* C. & R. Rev. N. Am. Umbell. 122 (1888). *Drudeophytum vestitum* C. & R. Contrib. U. S. Nat. Herb. 7:83 (1900).

14. VELAEA DC.

Subglabrous perennials with thick yellow elongated odorous taproots. Leaves mostly basal, pinnately or ternately compound. Ours usually without involucre, the involucels in our species of few small lanceolate bracts. Flowers yellow, in compound umbels. Fruit oblong or orbicular, somewhat laterally compressed, with acute or filiform equal ribs. Oil-tubes conspicuous, 3 to 6 in the intervals, 4 to 10 on the commissure. Seed-face strongly involute, inclosing a central cavity.—Species 7, Pacific North America. (Sebastian Eugenio Vela, student of the Umbelliferae.)

Leaves simply pinnate; ribs of carpel prominent.—Subgenus DEWEYA..........1. *V. arguta.*
Leaves ternate; ribs of carpel filiform, slender or inconspicuous.—Subgenus DRUDEOPHYTUM.
    Ultimate leaf-segments 1 to 2 inches long; bractlets conspicuous, often exceeding the umbellet; fruit 3 to 4 lines long..........2. *V. hartwegii.*
    Ultimate leaf-segments usually less than 1 inch long; bractlets inconspicuous, shorter than the umbellets.

Calyx-teeth obsolete; fruit nearly orbicular, 1 to 2 lines long, as broad or nearly as broad as long..........3. *V. kelloggii.*
Calyx-teeth evident; fruit oblong, 2 to 3 lines long..........4. *V. parishii.*

1. **V. arguta** C. & R. Plants 1 to 2½ feet high, the leaves simply pinnate, the blades 2 to 5 inches long, on petioles about 1½ times as long; leaflets 5 to 7, ovate, finely and sharply serrate, 1 to 2 inches long, the lowest often petiolulate; terminal and lowest leaflets often subcordate and often 3-lobed; rays 12 to 20, 1½ to 3 (or 5) inches long; pedicels 1 to 4 lines long; involucre mostly none; involucels of few linear acuminate bractlets; fruit oblong, 4 lines long; ribs acute, prominent; oil-tubes 3 to 5 in the intervals, 4 to 6 on the commissure.

Dry rocky exposed slopes, or under chaparral, 200 to 3500 feet: coastal Southern California from Santa Barbara Co. to San Diego Co. South to Lower California. Jan.-June, fr. May-July.

Locs.—Santa Barbara, *K. Brandegee;* Sespe Creek, Ventura Co., *Jones & Rich* (bractlets 2 or 3, filiform); Aliso Cañon, San Gabriel Mts., *Barber* 198; Echo Mt., *Peirson* 134; San Bernardino foothills, *Parish* 4470; Warren's Ranch, e. San Bernardino Mts., *T. Brandegee;* Chalk Hill, San Jacinto Mts., *Hall* 2083; Ramona, *T. Brandegee;* Mountain Springs grade (head of), e. San Diego Co., *Munz* 9626.

Refs.—VELAEA ARGUTA C. & R. Rev. N. Am. Umbell. 120 (1888); Jepson, Man. 715, fig. 699 (1925). *Deweya arguta* T. & G. Fl. 1:641 (1840), type loc. San Diego, *Nuttall;* C. & R. Contrib. U. S. Nat. Herb. 7:79, fig. 14 (1900). *Ligusticum argutum* Nutt.; T. & G. Fl. 1:641 (1840), as a synonym. *Arracacia arguta* Wats. Bibl. Index N. Am. Bot. 419 (1878). *Tauschia arguta* Mcbr. Contrib. Gray Herb. 56:32 (1918).

2. **V. hartwegii** C. & R. Plants mostly tufted, 1 to 3 feet high, the peduncles and leaves from a shortly branched caudex; peduncles and petioles somewhat scabrous; leaves biternate, or partly triternate, the ultimate lateral divisions mostly 3-foliolate, the ultimate middle divisions mostly 5 or 7-foliolate; leaflets ovate or oblong, sparingly incised, serrate, mucronate, ¾ to 2 inches long, or the leaflets often more or less confluent; petioles 2 to 6 inches long; rays about 15, 2 to 4 inches long in fruit; bracts none; bractlets 3 to 6, unequal, linear-lanceolate, long-pointed, exteriorly disposed, mostly surpassing the umbellets; fruit nearly orbicular, 3 to 4 lines long; ribs slender but rather prominent; oil-tubes 3 (or 4 to 6) in dorsal intervals, 3 or 4 (to 6) in laterals, 6 (in sets of 3) or 9 on the commissure.

Wooded or brushy slopes in the foothills, 800 to 5000 feet: Sierra Nevada foothills from Tulare Co. to Butte Co.; coastal Southern California in Ventura and Santa Barbara Cos.; South Coast Ranges from San Luis Obispo to Contra Costa Co. Mar.-Apr., fr. June-July.

Field note.—Velaea hartwegii is widely distributed but somewhat rare locally. Its taproot, 3 to 6 lines in diameter, often descends vertically for two feet or more.

Locs.—Sierra Nevada: South Fork Kaweah River above Clough Cave, *Jepson* 4655; Pine Ridge, Fresno Co., *Hall & Chandler* 310; Collins Mdw., Fresno Co., *Hall & Chandler* 531; Benton Mills, Mariposa Co., *Congdon;* Hazel Green, Mariposa Co., *Jepson* 14,328; New York Falls, Amador Co., *Hansen* 900; Little Chico Creek, *R. M. Austin.* Coastal S. Cal.: Ojai Valley, *F. W. Hubby;* Cuyama, *Eastwood.* South Coast Ranges: Estrella, *L. Jared;* Arroyo Grande, *Alice King;* Loma Prieta, *Davy* 640; Morrison Cañon, Niles, *Jepson* 14,330; Berkeley, *Jepson* 14,329; Mt. Diablo, *Greene.*

Refs.—VELAEA HARTWEGII C. & R. Rev. N. A. Umbell. 121 (1888); Jepson, Fl. W. Mid. Cal. 350 (1901), ed. 2, 295 (1911), Man. 716, fig. 700 (1925). *Deweya hartwegi* Gray, Proc. Am. Acad. 7:342 (1868), type loc. n. Sierra Nevada foothills, *Hartweg* 1748; Jepson, Erythea 5:55 (1897). *Drudeophytum hartwegi* C. & R. Contrib. U. S. Nat. Herb. 7:81, fig. 15 (1900). *Tauschia hartwegii* Mcbr. Contrib. Gray Herb. 56:32 (1918).

3. **V. kelloggii** C. & R. (Fig. 268.) Plants erect, ¾ to 2⅔ feet high; flowering stems leafless or with a single leaf only; leaves basal, 1 to 2 or 3 times ternate; leaflets ovate or roundish, sharply serrate and more or less incised or lobed, mostly ½ to 1 inch long; fruiting rays 2 to 4 inches long, or in fruit 3 to 4 inches long; pedicels 2 to 4 lines long; fruit nearly orbicular, 1 to 2 lines long, nearly as broad as long or a little broader, somewhat notched at base; ribs filiform; oil-tubes 3 in the dorsal intervals, 2 to 4 in the laterals, 4 to 6 on the commissure.

Rock ledges, brushy hillsides or cañons, 500 to 3500 feet: Coast Ranges from Santa Cruz Co. to Humboldt Co.; Sierra Nevada foothills from Tulare Co. to Butte Co. North to Oregon. Feb.-Apr., fr. July. It has a fairly wide distribution from north to south, but the known stations are infrequent.

Locs.—Coast Ranges: Santa Cruz Co. (Anderson, Nat. Hist. Santa Cruz Co. 38); Pilarcitos Cañon, San Mateo Co., *Davy;* Mt. Tamalpais, *Jepson* 14,324; Comptche, Mendocino Co., *H. A. Walker* 274; Maple Creek, Mad River, *Tracy* 2607; Willow Creek, Trinity River, *Tracy* 3289. Sierra Nevada foothills: Kaweah (Contrib. U. S. Nat. Herb. 7:82); Millwood (Sequoia Mills), (Contrib. U. S. Nat. Herb. 7:82); Folsom (Contrib. U. S. Nat. Herb. 7:82); Eldorado Co., *Shockley;* Stirling, Butte Co., *Heller* 10,811.

Refs.—VELAEA KELLOGGII C. & R. Rev. N. A. Umbell. 121 (1888); Jepson Fl. W. Mid. Cal. 350 (1901), ed. 2, 294 (1911), Man. 716 (1925). *Deweya kelloggii* Gray, Proc. Am. Acad. 7:343 (1868), type loc. Bolinas Bay, *Kellogg. Drudeophytum kelloggii* C. & R. Contrib. U. S. Nat. Herb. 7:81 (1900).

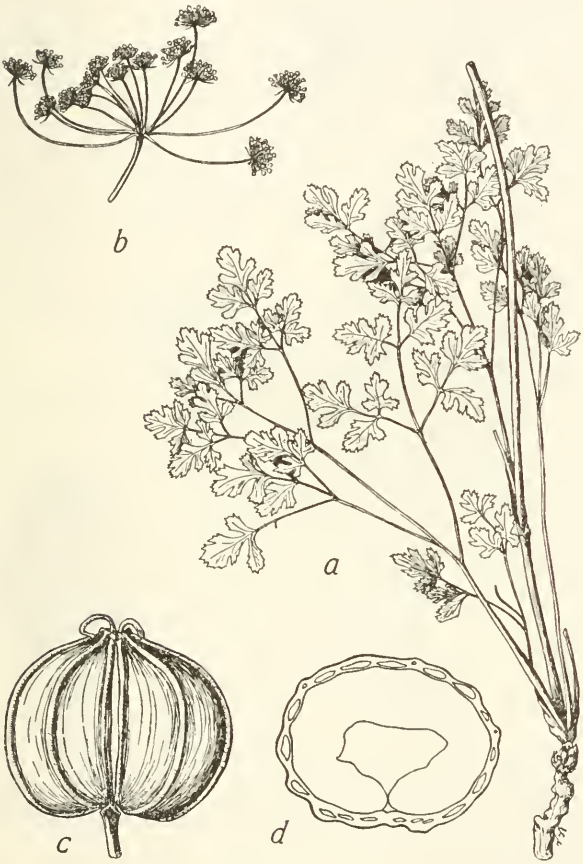


Fig. 268. VELAEA KELLOGGII C. & R. *a*, lower part of plant, × ¼; *b*, umbel, × ½; *c*, fr., × 6; *d*, cross sect. of carpel, × 7.

4. **V. parishii** C. & R. (Fig. 269.) Plants erect, short (½ to 1½ feet high), with mostly basal leaves; herbage glabrous throughout; leaves ⅓ to ½ as long as flowering stems, thickish, bipinnate, the segments ovate, irregularly incised or cuspidate-toothed, 4 to 7 lines long; rays 14 to 20, 1 to 2¼ inches long; pedicels 2 to 3 lines long; pedicels of sterile flowers often equaling the fruit; involucre none; involucels of a few setaceous bractlets; calyx-teeth prominent; fruit oblong, 2 to 3 lines long; oil-tubes 3 or 4 in the intervals, 4 or 5 on the commissure.

Rocky or gravelly slopes or benches, often in open pine forest, 4000 to 8500 feet: mountains of cismontane Southern California; southern Sierra Nevada in Tulare and Inyo Cos. May-June, fr. July-Aug.

Locs.—Laguna Mts., San Diego Co., *E. Bethel;* Santa Rosa Indian Village, Santa Rosa Mts., *Jepson* 1441; Kenworthy, San Jacinto Mts., *Munz* 5454; Cushenbury Cañon, San Bernardino Mts., *Parish* 2379; Mt. Wilson, *Davidson;* Mt. Lowe, *Peirson* 136; Bitter Creek, Mt. Pinos, *Hall* 6633; Piute Peak, Kern Co., *Purpus* 5339; Lloyd Mdws., Kern River, *Jepson* 4901; Cottonwood Creek near Timosea Peak, Inyo Co., *Jepson* 5085.

Refs.—VELAEA PARISHII C. & R. Rev. N. Am. Umbell. 121 (1888), type loc. San Bernardino Mts., *S. B. & W. F. Parish* 978, 1827 (typ. vidi); Jepson, Man 716 (1925). *Drudeophytum parishii* C. & R. Contrib. U. S. Nat. Herb. 7:82 (1900). *Cymopterus owenensis* Jones, Contrib. W. Bot. 12:26 (1908), type loc. lower east slope of Mt. Whitney, *Jones* (cf. Mathias, Ann. Mo. Bot. Gard. 17:397). *Tauschia parishii* Mcbr. Contrib. Gray Herb. 56:32 (1918).

15. FOENICULUM L.

Stout glabrous perennial with dark green aromatic herbage. Leaves decompound, dissected into numerous filiform segments. Flowers yellow, in large compound umbels. Involucre and involucels none. Calyx-teeth obsolete. Fruit oblong, the ribs prominent. Oil-tubes solitary in the intervals, 2 on the commissure.—Species 3, Europe, Asia and Africa. (Diminutive of Latin foenum, hay, from its odor.)

1. **F. vulgare** Hill. SWEET FENNEL. Stem striate, branching, 3 to 7 feet high; herbage glaucous; rays ½ to 2½ inches long; fruit 1½ to 2 lines long.

European garden plant, widely naturalized about towns and frequenting waste places on old farms and by country lanes, 5 to 2000 feet. June, fr. Aug.

Locs.—Whitmore, Shasta Co., *Alma Weigart* in 1922; Lake Co., *P. E. Goddard* in 1901; Sacramento, *Bioletti;* Batavia, Solano Co., *Jepson* in 1927; Vacaville; St. Helena, *Jepson* 14,234 in 1894; Benicia, *Jepson* 9064 in 1920; Berkeley, *Jepson;* Berryessa, Santa Clara Co., *Davy* 7058; Monterey, *Jepson* in 1896; San Luis Obispo, *Jepson* in 1908; Los Angeles in 1898 (Dav. & Mox. Fl. S. Cal. 263); San Bernardino in 1890 (Bull. S. Cal. Acad. 19^4:22).

Refs.—FOENICULUM VULGARE Hill, Brit. Herb. 413 (1756); Jepson, Fl. W. Mid. Cal. 355 (1901), ed. 2, 299 (1911), Man. 717, fig. 701 (1925). *Anethum foeniculum* L. Sp. Pl. 263 (1753), type European.

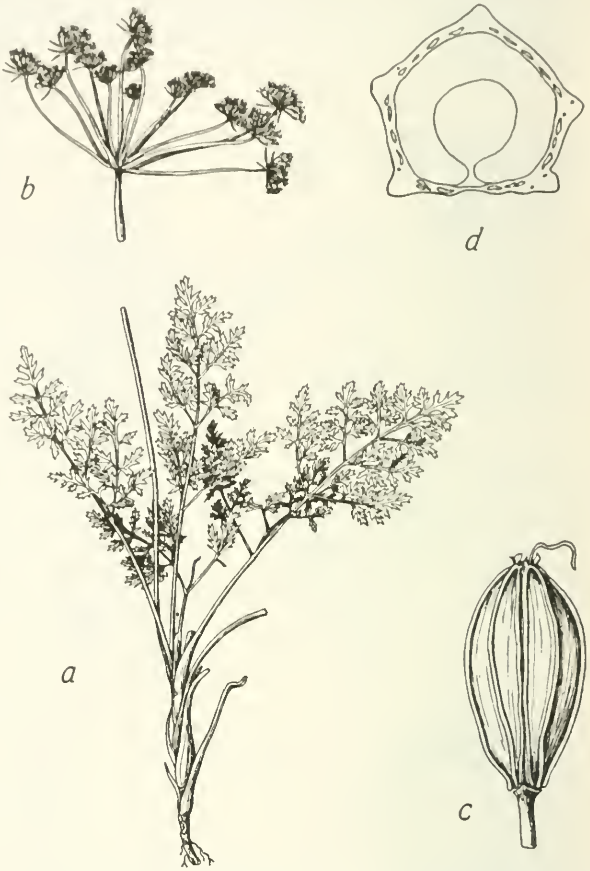


Fig. 269. VELAEA PARISHII C. & R. *a,* lower part of plant, × ¼; *b,* umbel, × ½; *c,* fr., × 3; *d,* cross sect. of carpel, × 7.

16. BERULA Hoffm.

Glabrous aquatic or marsh perennial. Leaves simply pinnate, the leaflets sharply and sometimes somewhat saliently serrate or irregularly incised. Involucre and involucels present, the bracts and bractlets narrow. Flowers white, in compound umbels. Calyx-teeth minute. Fruit roundish, flattened laterally, obscurely notched at base. Carpels with very slender and inconspicuous ribs and thick corky pericarp. Oil-tubes numerous, contiguous, surrounding the seed.—Species 1. (Latin name of the Water Cress.)

1. **B. erecta** Cov. Erect, corymbosely branching, ⅓ to 2 feet high; leaflets 3 to 9 pairs, ovate to oblong, ¼ to 2½ inches long; fruiting rays ½ to 1 inch long; pedicels 1½ to 2 lines long; fruit ¾ line long.

Swamps and streams, 500 to 4000 feet: coastal Southern California, thence transmontane through the deserts to Inyo Co. and north to Siskiyou Co. North America, Europe and Asia. July.

Locs.—Ramona, *K. Brandegee;* Los Angeles, *Geo. B. Grant* 104; Pasadena, *McClatchie* 475; Oak Knoll, Pasadena, *Braunton* 647; Ft. Tejon (Contrib. U. S. Nat. Herb. 7:117); Owens Lake, *Jepson* 5113; Resting Sprs. (Contrib. U. S. Nat. Herb. 4:115); Sisson, *Jepson* 14,212.

Refs.—Berula erecta Cov. Contrib. U. S. Nat. Herb. 4:115 (1893); C. & R. Contrib. U. S. Nat. Herb. 7:116, fig. 32 (1900); Jepson, Fl. W. Mid. Cal. 354 (1901), ed. 2, 298 (1911), Man. 712, fig. 693 (1925). *Sium erectum* Huds. Fl. Angl. 103 (1762), type loc. presumably England. *Berula angustifolia* B. & W. Bot. Cal. 1:260 (1876).

17. **CICUTA** L. Water Hemlock

Tall branching glabrous perennials growing in marshes or by stream banks. Rootstocks short and erect, or horizontal and branching. Leaves at least partially twice or thrice pinnate. Flowers white, in compound umbels. Involucre present or none. Involucels of small bractlets. Calyx-teeth somewhat prominent. Styles somewhat short. Fruit flattened laterally, broadly ovate to roundish. Ribs corky, broad but low, the lateral in cross section larger than the intermediate and dorsal. Oil-tubes 2 on the commissure, solitary in the intervals.—Species 7, North America, Europe and Asia. (Classical name of the Hemlock, which was given to criminals, and sometimes, when the Greeks had a superfluity, to philosophers, as a death-poison.)

Fruit with the intervals red-brown, contrasting with the corky ribs; intervals broad.
  Plants of living streams.
    Leaves simply pinnate or partially bipinnate below..........1. *C. californica.*
    Leaves bi- to tri-pinnate..........2. *C. douglasii.*
  Plants of salt-marshes..........3. *C. bolanderi.*
Fruit with intervals of much the same color as the ribs; intervals very narrow..........4. *C. vagans.*

1. **C. californica** Gray. California Water Hemlock. Stems about 3 feet high; blades of basal leaves pinnate or partly bipinnate below, 1 to 2½ feet long, on long (½ to 1½ feet) petioles; leaflets ovate-lanceolate or lanceolate, serrate, 3 to 5 inches long, often deeply 1-lobed on one side towards the base so as to make a supplementary leaflet; rays somewhat unequal, 1¼ to 2½ inches long; pedicels 2 to 4 lines long; involucre none, or merely 1 narrow bract; bractlets several, ovate, acuminate; fruit 1 to 1¼ lines long with narrow not depressed oil-tubes, those on the face approximate near the median line; ribs large and corky, rounded, yellowish, the intervals very narrow or lineate, dark red-brown.

Swamps or lake borders, 5 to 3700 feet: Coast Ranges from Mendocino and Lake Cos. to Monterey Co. June, fr. Aug.

Locs.—Mendocino Co. (Contrib. U. S. Nat. Herb. 7:95); Mt. Hull, n. Lake Co., *Hall* 9573; Leona, Oakland Hills, *Michener & Bioletti;* Ben Lomond, Santa Cruz Mts., *C. E. Worden;* Carmel River, near Carmel, *Jepson* 14,229. The styles in our material are about twice as long as in the case of species nos. 2, 3 and 4.

Refs.—Cicuta californica Gray, Proc. Am. Acad. 7:344 (1868), type loc. Monterey, *Hartweg* 1754; Jepson, Man. 710 (1925). *C. virosa* var. *californica* C. & R. Rev. N. Am. Umbell. 130 (1888); Jepson, Fl. W. Mid. Cal. 351 (1901), ed. 2, 295 (1911).

2. **C. douglasii** C. & R. Western Water Hemlock. Stems stout, glaucous, 3 to 6 feet high; herbage often purplish; rootstocks short; leaves bipinnate; leaflets sessile or nearly so, lanceolate, 1½ to 4 inches long, coarsely incised-serrate to serrulate, sometimes falcate; involucre none or of a few lanceolate bracts; involucels consisting of 9 to 12 lanceolate-acuminate bractlets; rays 1½ to 2½ inches long; pedicels 2 lines long; fruit sub-orbicular, 1 to 2 lines long; ribs very broad and low; intervals narrow, red-brown, sharply defined from the light-colored ribs; oil-tubes small; seed not channeled under the oil-tubes.

In active streams or in wet meadows in the mountains or in swamps in valleys, 5 to 7000 feet: coastal Southern California; easterly parts of the Sierra Nevada or its east side bordering valleys from Inyo Co. to Modoc Co.; North Coast Ranges from Humboldt Co. to Siskiyou Co. North to Alaska. July-Aug., fr. Aug.-Sept.

Locs.—Coastal S. Cal.: San Bernardino, *Parish;* Los Angeles, *Davidson.* Sierra Nevada or its east side valleys: Lone Pine, Inyo Co., *Jepson* 5153; Big Pine, Inyo Co., *P. J. Giraud;* Red Mdw., Madera Co., *A. L. Grant* 1561a; Quincy, *Hall* 9376; Susanville, *Pearl Safford;* Ft. Bidwell, Modoc Co., *Jepson* 7921. North Coast Ranges: Humboldt Bay, *Tracy* 2597; High Prairie, Bald Mt., Humboldt Co., *Tracy* 7179; Shasta Sprs., *Condit;* Sisson, Siskiyou Co., *Jepson* 14,230; Edgewood, Siskiyou Co., *T. Brandegee;* Oro Fino, Siskiyou Co., *Butler* 456.

Refs.—Cicuta douglasii C. & R. Contrib. U. S. Nat. Herb. 7:95 (1900); Jepson, Man. 710, fig. 691 (1925). *Sium douglasii* DC. Prod. 4:125 (1830), type from northwest America, *Douglas. C. occidentalis* f. *frondosa* Greene, Pitt. 2:7 (1889), type loc. Tehachapi, *Greene. C. frondosa* Greene, Lflts. 2:236 (1912). *C. valida* Greene, lc. 238, type loc. e. slope Sierra Nevada in Mono Co., *Bolander.*

3. **C. bolanderi** Wats. Suisun Water Hemlock. Stem 5 to 10 feet high, branched above, with nearly or quite vertical rootstock and large basal and cauline bipinnate leaves ¾ to 2 feet long; leaflets lanceolate, serrate, 1¼ to 3 inches long; bracts and bractlets lanceolate, the former often scarious-margined; rays 1 to 1½ inches long, subequal, pedicels 2 lines long; fruit 1½ to 2 lines long, prominently ribbed, the carpels when quite mature rather strongly concave on the commissure, thus appearing somewhat lunate; oil-tubes broad, depressed in the channeled seed.

Marshes, 1 to 10 feet: Suisun Bay borders. June, fr. Aug.

Locs.—Suisun Marshes, *Jepson* 14,232; Benicia, *Jepson* 14,233; Martinez, *Davy* 6668.

Refs.—Cicuta bolanderi Wats. Proc. Am. Acad. 11:139 (1876), type loc. Suisun Marshes, *Bolander;* Jepson, Fl. W. Mid. Cal. 351 (1901), ed. 2, 296 (1911), Man. 711 (1925).

4. **C. vagans** Greene. Idaho Water Hemlock. Habit and appearance of no. 2; corky ribs low and broad, brownish, the intervals of the same color and not revealing the oil-tubes.

Along stream banks, 4000 to 5500 feet: east side of the Sierra Nevada in Nevada Co. East to Nevada, north to Idaho. July, fr. Sept.

Locs.—Truckee, *Sonne* 51, *Kennedy* 4603. Nev.: Reno, *Kennedy.*

Refs.—Cicuta vagans Greene, Pitt. 2:9 (1889), type loc. Lake Pend d'Oreille, Ida., *Greene;* Jepson, Man. 711 (1925). *C. sonnei* Greene, Lflts. 2:239 (1912), type loc. Truckee, *Sonne, Greene.*

18. **OENANTHE** L.

Aquatic glabrous herbs with succulent stems from thick rootstocks. Leaves pinnately compound. Flowers white, in compound umbels terminating the branches. Involucre present or none. Involucels present. Calyx-teeth rather prominent. Styles slender, at length elongated and ½ as long as the fruit. Fruit in ours cylindric, slightly flattened laterally. Ribs broad, obtuse, corky; commissural face also corky. Oil-tubes solitary in the intervals, 2 on the commissure, the seed furrowed beneath them.—Species about 30, all continents save South America. (Ancient Greek name of some thorny plant.)

1. **O. sarmentosa** Presl. Pacific Oenanth. Stems 2 to 4 feet high; leaves bipinnate, or the lowest ones elongated-pinnate (1 to 2 feet long), or partially bipinnate towards the base; leaflets ovate, serrate, coarsely toothed or incised, ¾ to 1½ (or 2½) inches long; rays ¾ to 1 inch long; bracts few or none; bractlets lanceolate, acuminate; fruit 1 to 2 lines long, the ribs very corky and somewhat turgid.

Slow streams or shallow ponds, often filling them with dense masses, 5 to 3000 feet: coastal Southern California; Coast Ranges; rare in the northern Sierra Nevada. North to British Columbia. June.

Locs.—Coastal S. Cal.: Laguna Mts., e. San Diego Co., *T. Brandegee;* Palomar Mt., *T. Brandegee;* San Bernardino Valley, *Parish* 976; Ballona Creek, Los Angeles Co., *Abrams* 2526. Coast Ranges: Carmel River, *Jepson* 14,224; Alviso, Santa Clara Co., *Jepson* 9316 (intergrade to var. californica); Guerneville, Sonoma Co., *E. Ferguson;* Ft. Bragg, *W. C. Mathews* 164; Centerville, Humboldt Co., *Tracy* 6910; Samoa, Humboldt Co., *Tracy* 3088. Northern Sierra Nevada:

Amador Co. and Plumas Co. (Contrib. U. S. Nat. Herb. 7:122). The species passes by indefinite gradations into the var. CALIFORNICA C. & R., the leaflets of the upper leaves crowded on the rachis and tending to be conduplicate.—Chiefly central Coast Ranges: Santa Cruz, *Kennedy;* San Jose, *Jepson* 14,225; Jarvis Ldg., Alameda Co., *Jepson* 14,226; Mt. Tamalpais, *Jepson;* Pt. Reyes, *Jepson* 1178 (fruit ovoid-cylindric); Howell Mt. foothills, *Jepson* 14,228 (bractlets very conspicuous, exceeding the flowers); Suisun Marshes, *Jepson* 14,227; Blue Lakes, Lake Co., *Jepson.*

Refs.—OENANTHE SARMENTOSA Presl; DC. Prod. 4:138 (1830), type loc. Nootka Sound, Vancouver Isl., *Haenke;* Jepson Fl. W. Mid. Cal. 354 (1901), ed. 2, 298 (1911), Man. 711, fig. 692 (1925). Var. CALIFORNICA C. & R. Rev. N. A. Umbell. 92 (1888); Contrib. U. S. Nat. Herb. 7:122, fig. 35 (1900); Jepson, Fl. W. Mid. Cal. ed. 2, 298 (1911). *O. californica* Wats. Proc. Am. Acad. 11:139 (1876), type loc. marshes at Pt. Lobos, San Francisco (the locality first cited); Jepson, Fl. W. Mid. Cal. 354 (1901).

19. LILAEOPSIS Greene

Small glabrous perennials. Stems fistulous, creeping and rooting in the mud, only the leaves and short peduncles erect. Leaves reduced to hollow cylindrical petioles jointed by transverse partitions. Flowers dull white or slightly tinged with pinkish-brown, in a few-flowered simple umbel. Bracts of the involucre minute. Fruit subglobose. Dorsal ribs filiform, the lateral corky and thickened next to the commissure. Oil-tubes solitary (rarely 2) in the intervals, 2, 4 or 6 on the commissure.—Species 14, North and South America and Australia. (Named for its resemblance to Lilaea.)

1. **L. occidentalis** C. & R. Leaves 1 to 8 inches long, 1 to 2 lines wide; peduncles 1 inch long or less; fruiting pedicels 1½ to 3 lines long; petals plane; fruit 1 line long.

Salt marshes or brackish mud flats, 1 to 100 feet: along the coast from Marin Co. and Suisun Bay to Humboldt Co. North to Alaska. June-July, fr. Sept.-Oct.

Locs.—Suisun Bay, s. shores (acc. *K. Brandegee*); Abbotts Lagoon, Pt. Reyes, *Jepson* 1165; Bodega Head, *K. Brandegee;* Samoa, Humboldt Co., *Tracy* 3102; Stone Lagoon, Humboldt Co., *Jepson* 9333.

Refs.—LILAEOPSIS OCCIDENTALIS C. & R. Bot. Gaz. 24:48, fig. 2 (1897), type loc. Yakima Bay, Ore., *Hall* 205; Contrib. U. S. Nat. Herb. 7:123, fig. 37 (1900). *L. lineata* Jepson, Fl. W. Mid. Cal. ed. 2, 298 (1911). *Crantzia lineata* Jepson, Fl. W. Mid. Cal. ed. 1, 353 (1901). *L. lineata* var. *occidentalis* Jepson, Madroño 1:139 (1923), Man. 714, fig. 697 (1925).

20. SIUM L.

Glabrous perennial marsh or aquatic herbs with leafy stems. Leaves simply pinnate; leaflets finely serrate. Flowers white, in compound umbels. Bracts and bractlets several to many. Calyx-teeth minute. Styles short. Stylopodium depressed. Fruit ovate or oblong, somewhat laterally compressed, with narrow commissure. Ribs corky, prominent or somewhat salient, with broad red-brown intervals. Oil-tubes 1 to 3 in the intervals, always 2 or 3 in at least one of the intervals, 2 to 6 on the commissure.—Species 9, North America, Europe, Asia and Africa. (Sion, Greek name of some water plant.)

1. **S. cicutaefolium** Schrank. WATER PARSNIP. Stem stout, simple, 2½ to 3½ feet high, from a cluster of fleshy-fibrous roots; leaves ½ to 3½ feet long; leaflets 5 to 13, lanceolate, 2 to 4 inches long; bracts and bractlets ovate to lanceolate, the bracts reflexed, scarious-margined below; fruit ovoid, 1½ lines long, with acute ribs.

Sloughs, ponds and bogs, 3400 to 6500 feet: Sierra Nevada from Butte Co. to Modoc and Siskiyou Cos. North to British Columbia, east to Virginia. July-Aug., fr. Sept.

Locs.—Chico Mdws., Butte Co., *Heller* 11,641; Honey Lake Valley, *Davy* 3363; upper Fall River Valley, ne. Shasta Co., *Jepson* 5768; Sisson, Siskiyou Co., *Jepson* 14,241; South Fork Valley, Modoc Co., *Jepson* 7824; Egg Lake, Modoc Co., *M. S. Baker.*

Var. **heterophyllum** Jepson. Lowest leaves with long fistulous petioles, the blades simple or few-pinnate.—Marshes in the Great Valley: Suisun Marshes, *Jepson* 2460e; Stockton, *Greene*.

Refs.—SIUM CICUTAEFOLIUM Schrank, Baier. Fl. 1:588 (1789); Jepson, Man. 712, fig. 694 (1925). Var. HETEROPHYLLUM Jepson, Fl. W. Mid. Cal. 353 (1901), ed. 2, 297 (1911), Man. 712 (1925). *S. heterophyllum* Greene, Pitt. 2:102 (1890), type loc. Suisun Marshes, *Greene*.

21. OROGENIA Wats.

Dwarf glabrous perennial herbs with fleshy roots. Stems from the root-crown 1 to 4, very short, mostly underground, sheathed by large scarious bracts. Leaves basal, ternate or biternate, with linear segments. Involucre none. Involucels of few linear bractlets. Flowers white, in compound umbels, the rays very unequal. Fruit oblong, only slightly flattened laterally. Carpels flattened dorsally; dorsal and intermediate ribs filiform; lateral ribs strongly corky-thickened, extended towards the companion carpel so as to leave a large central cavity which is divided longitudinally by a thick corky ridge from the middle of each face. Oil-tubes small, 3 in the intervals, 2 to 4 on the commissure.—Species 2, western North America. (Greek oros, mountain, and genos, race, referring to the habitat.)

1. **O. fusiformis** Wats. Plants 3 to 4 inches high, arising from a long fusiform root; leaf-segments ½ to 2½ inches long; umbels 2 to 10-rayed; rays 1 to 11 lines long; umbellets capitate, 2 to 2¼ lines wide; fruit about 3 lines long.

Wet sandy soil, 4000 to 5500 feet: east side or easterly valleys of the Sierra Nevada from Nevada Co. to Plumas Co. North to Oregon. Apr., fr. July-Aug.

Locs.—Road to Donner Lake near Truckee, *Sonne*; Prosser Creek, Nevada Co., *Sonne*. Ore.: Ashland Butte, *Cusick* 2892.

Refs.—OROGENIA FUSIFORMIS Wats. Proc. Am. Acad. 22:474 (1887), type loc. Plumas Co., *R. M. Austin*; Jepson, Man. 712 (1925).

22. HERACLEUM L.

Tall perennials with stout stems from thick horizontal rootstocks. Leaves very large, ternately compound, with broad sheathing petioles. Flowers white, in a large many-rayed compound umbel. Involucre deciduous. Involucels of numerous bractlets. Petals obcordate, the marginal ones of the umbel much larger. Fruit almost orbicular, strongly compressed. Lateral ribs with a thin wing; dorsal and intermediate ribs filiform. Oil-tubes 2 on the commissure, 1 in each interval, visible from the outside and reaching from the summit to about the middle of the carpels.—Species 60, Europe, Asia and north Africa, 1 species in North America. (Named for Hercules, who, it is said, first used it in medicine.)

1. **H. lanatum** Michx. COW PARSNIP. Plants 4 to 7 feet high; leaflets 3, petiolulate, ovate or orbicular, sharply serrate and lobed, 3 to 6 inches broad; umbels 6 to 10 inches broad; fruit 3½ to 5 lines long.

Brushy cañon sides or north slopes in the hills, 5 to 8000 feet: San Jacinto and San Bernardino mountains; Coast Ranges from Monterey Co. to Humboldt Co., usually near the sea; Sierra Nevada from Fresno Co. to Modoc Co. North to Alaska, east to the Atlantic. Apr., fr. Aug.

Locs.—Coastal S. Cal.: San Jacinto Mts. (Univ. Cal. Publ. Bot. 1:98); Little Bear Valley, San Bernardino Mts., *Parish* 1668. Sierra Nevada: Simpson Mdw., Middle Fork Kings River, *Henrietta Eliot*; Ward Lake, South Fork San Joaquin River, *Jepson* 16,079; Bench Mdw., Kaiser Ridge, *Jepson*; Kennedy Lake, Tuolumne Co., *A. L. Grant* 240; Dorrington, Calaveras Co., *Jepson*; Mt. Tallac, *C. J. Fox*; Jonesville, Butte Co., *Copeland*; Ft. Bidwell, *Manning*. Coast Ranges: Monterey, *Jepson*; Halfmoon Bay, San Mateo Co., *Jepson*; Mt. Davidson, San Francisco, *Jepson*; Oakland Hills, *Jepson* 5716; Berkeley Hills, *Jepson* 14,236; Sycamore Cañon, Mt. Diablo, *Jepson*; Inverness, Marin Co., *Jepson*; Carlotta, Humboldt Co., *Tracy* 4511; Burnt Ranch, Trinity Co., *Tracy* 6407.

Refs.—HERACLEUM LANATUM Michx. Fl. Bor. Am. 1:166 (1803), type from Canada; C. & R. Contrib. U. S. Nat. Herb. 7:248, fig. 64 (1900); Jepson, Fl. W. Mid. Cal. 360 (1901), ed. 2, 304 (1911), Man. 717, fig. 702 (1925).

23. LEPTOTAENIA Nutt.

Tall stoutish perennials, with thick fusiform roots and ternately compound leaves. Flowers yellow or purple, in compound umbels. Involucre of few bracts or none. Involucels of several small bractlets or none. Fruit oblong to suborbicular, strongly compressed. Lateral ribs with broad corky-thickened wings coherent until maturity. Dorsal and intermediate ribs filiform and approximate. Oil-tubes 1 to 8 in the intervals, 2 to 10 on the commissure or obscure and apparently none.—Species 10, Pacific Coast of North America. (Greek leptos, narrow, and tainia, vittae or oil-tubes.)

Stems leafy below; leaves large, the ultimate segments short.
  Leaves glabrous; oil-tubes present..........1. *L. californica.*
  Leaf margins and veins puberulent beneath; oil-tubes none..........2. *L. dissecta.*
Peduncles and leaves from the root-crown; leaves smaller, glabrous, the segments linear, elongated or grass-like.
  Bracts obovate; wings thicker than the body of the fruit..........3. *L. anomala.*
  Bracts lanceolate, entire; wings not so thick as the body of the fruit..........4. *L. humilis.*

1. **L. californica** Nutt. Chu-chu-pate. Erect, 2 to 4 feet high, glabrous, glaucous; leaves once or twice ternate, then pinnate; leaflets 1 to 2 inches long or more, cuneate-orbicular or -obovate, 3-lobed or the terminal 3-parted, serrate above; peduncles at summit abruptly widened into a disk-like dilation; rays subequal, 2 to 3 inches long; bracts none; fruiting pedicels 3 to 9 lines long; bractlets few or none; fruit elliptical, narrowly winged, 4 to 6 lines long; oil-tubes 6 to 10 on the commissure (the lateral frequently anastomosing), 3 or 4 in the intervals or sometimes obscure.

Wooded or brushy slopes, 500 to 5500 feet: Piute Mts., Kern Co.; Mt. Pinos region; Coast Ranges from San Benito Co. to Siskiyou Co. North to Oregon. Apr., fr. June-July.

Field note.—The roots are valued medicinally by the native tribes and are also used in connection with various tribal ceremonies by the Hupas and doubtless by other tribes. The young shoots (says J. W. Kisling) are sought by the Klamath Indians and used as food, as also the roots (Jepson Field Book 17:186 ms.). They also smoke the triturated dried root (Jepson Corr. 5:470 ms.).

Locs.—Piute Mts.: Piute Peak, *Purpus* 5092. Mt. Pinos region: Ft. Tejon (Contrib. U. S. Nat. Herb. 7:203); Frazier Mt.; Mt. Pinos, *Bertha Fuller.* Coast Ranges: Lorenzo Creek, San Benito River, *Bettys;* Cedar Mt., Mt. Hamilton Range, *Elmer* 4347; Mt. Diablo, *Mary Bowerman;* Vaca Mts., *Jepson* 14,245; Devils Gate, Putah Pass, *Jepson* 10,408; Calistoga, *Jepson* 14,247; Potter Valley, Mendocino Co., *Purpus;* Mail Ridge, s. Humboldt Co., *Jepson* 1892a; Low Gap, ridge betw. Van Duzen and Mad Rivers, *Tracy* 2905; Yreka, Siskiyou Co., *Butler* 799. Ore.: Keno, Klamath River, *Cusick* 2837.

Refs.—Leptotaenia californica Nutt.; T. & G. Fl. N. Am. 1:630 (1840), type loc. Santa Barbara, *Nuttall;* Jepson, Fl. W. Mid. Cal. 356 (1901), ed. 2, 300 (1911), Man. 718, fig. 703 (1925). *L. californica* var. *platycarpa* Jepson, Erythea 1:8 (1893), type loc. Gates Cañon, Vaca Mts., *Jepson* 14,248, 14,249; Fl. W. Mid. Cal. 357 (1901), ed. 2, 300 (1911). *L. californica* var. *dilatata* Jepson, Erythea 1:63 (1893), type loc. Elk Ridge, Mendocino Co., *Bolander* 6526.

2. **L. dissecta** Nutt. Ritual Root. Plants 1½ to 2¾ feet high, leafy at base; leaves broad, 2 or 3 times ternate and then once or twice pinnate, the segments incised-pinnatifid; ultimate segments linear-oblong, 1 to 2 lines long; peduncles 1 to 2 feet long; fruiting rays 2 to 4½ inches long; involucre of few bracts or none; involucels of several lanceolate bractlets; flowers yellow or purplish; fruit oblong, 5 to 9 lines long, sessile or on pedicels 1 line (rarely to 3 lines) long; dorsal and intermediate ribs filiform or sometimes obscure; oil-tubes none or very obscure.

Openly wooded or brushy slopes, 500 to 3500 feet: North Coast Ranges from Mendocino Co. to Siskiyou Co.; Sierra Nevada from Mariposa Co. to Shasta Co. North to British Columbia. Apr., fr. June-July.

Locs.—North Coast Ranges: Ukiah, *Bolander* 3926; Redwood House, Yager Creek, Humboldt Co., *M. S. Baker* 57; Buck Mt., Humboldt Co., *Tracy* 4237; Hupa, *Chandler* 1340; Dyer ranch to Hawkins Bar, Trinity Co., *Jepson* 1996; Yreka, *Butler* 746. Sierra Nevada: Agua Fria, Mariposa Co., *Congdon;* Antelope Valley, s. of Truckee, *L. S. Smith* 1603; Fall River Sprs., *Hall & Babcock* 4206.

Var. **multifida** Jepson. Washoe Root. Leaves dissected into linear segments 2 to 4 lines long; fruiting pedicels 3 to 7 lines long; fruit 5 to 7½ lines long; seed face concave.—Montane, 3500 to 8000 feet: mountains of Southern California; Tehachapi Mts.; east side or easterly summit valleys or cañons of the Sierra Nevada from Inyo Co. to Modoc Co. Eastward to New Mexico and Montana, north to Washington.

Locs.—S. Cal. mts.: San Antonio Mts., *Peirson* 2153 (Coldwater Cañon), 3187 (Big Pines); Elizabeth Lake region, acc. *Peirson;* Indian Cañon, San Rafael Mts., *Hall* 7807. Tehachapi Mts.: Double Mt., *Jepson* 7422. Sierra Nevada: Andrews Camp, w. Inyo Co., *K. Brandegee;* Kennedy Lake, Tuolumne Co., *A. L. Grant* 245, 211; Truckee, *Sonne;* Sierra Valley, *Lemmon;* Ft. Bidwell, *Manning* 110.

Refs.—Leptotaenia dissecta Nutt.; T. & G. Fl. N. Am. 1:630 (1840), type loc. mouth of the Willamette River, *Nuttall;* Jepson, Fl. W. Mid. Cal. 357 (1901), ed. 2, 300 (1911), Man. 718 (1925). *Ferula dissecta* Gray, Proc. Am. Acad. 7:348 (1868). *F. dissoluta* Wats. Bot. Cal. 1:271 (1876). Var. multifida Jepson, Madroño 1:145 (1923), Man. 718 (1925). *L. multifida* Nutt.; T. & G. Fl. 1:630 (1840), plains of the Columbia River east of Walla Walla and in the Blue Mts., *Nuttall;* C. & R. Contrib. U. S. Nat. Herb. 7:198, fig. 59 (1900).

3. **L. anomala** C. & R. Viper Parsnip. Plants 10 to 12 inches high, glabrous throughout; leaves all basal, ternate, then pinnate, the divisions few, distant, very narrowly linear, ½ to 3 inches long; peduncles arising from the root-crown, slender, 6 to 8 inches high; rays 3 to 6, unequal, 1¼ to 3 inches long in fruit; pedicels about 1 line long, the umbellets in fruit forming a compact cluster; involucre none; involucels conspicuous, the bractlets prominent, obovate, scarious-margined, veiny, toothed near the apex, more or less united; fruit elliptic to oblong, 3 to 4 lines long, the lateral ribs corky-thickened (much thicker than the body), the others filiform; oil-tubes none or inconspicuous.

Foothills, 200 to 1300 feet: Sierra Nevada foothills from Amador Co. to Nevada Co.; Shasta Co. Apr., fr. June.

Locs.—Carbondale, Amador Co.; Gautier bridge, Bear River, w. Nevada Co., *Hall* 10,153; Anderson, Shasta Co., *Alice King.*

Refs.—Leptotaenia anomala C. & R. Rev. N. Am. Umbell. 53 (1888), type loc. Carbondale, Amador Co., *Curran;* Jepson, Man. 718 (1925).

4. **L. humilis** C. & R. Lava Parsnip. Like no. 3; bractlets linear to lanceolate, entire; wings of the fruit corky-thickened but not as thick as the body.

Plains, 200 to 500 feet: Butte Co. to Tehama Co. Mar., fr. May.

Tax. note.—Leptotaenia humilis is so little known that a proper evaluation of it is not yet possible. Lying within the natural range of L. anomala C. & R., its relationship to that species is uncertain, while as to the flowering stages a closer definition of it as opposed to Lomatium marginatum C. & R. and Lomatium alatum C. & R. is much needed.

Locs.—Chico; Red Bluff (rubble field 4 mi. ne.), *Jepson* 16,359.

Var. **denticulata** Jepson. Wings of the fruit with denticulate margins; intervals commonly with about 3 longitudinal striae.—Blue Ravine, Eldorado Co.

Refs—Leptotaenia humilis C. & R. Contrib. U. S. Nat. Herb. 7:200 (1900), type loc. plains near Chico, *Bruce* 2661; Jepson, Man. 718 (1925). Var. denticulata Jepson, Madroño 1:146 (1923), type loc. Blue Ravine, Eldorado Co., *K. Brandegee;* Man. 718 (1925).

24. **LOMATIUM** Raf. Hog-Fennel

Low perennials, mostly of dry ground, with thick roots. Stems usually several from the root-crown, naked or few-leaved. Leaves decompound, often dissected, wholly basal or sometimes partly sub-basal. Flowers white or yellow, rarely purple, in compound umbels. Involucre none (a few species sometimes with 1 to 3 bracts). Involucels usually present. Fruit roundish to broadly or narrowly oblong, much compressed. Lateral ribs winged, the wings of the companion carpels coherent until maturity. Stylopodium wanting or not obvious in the fruit. Oil-tubes 1 to 4 in the intervals, 2 to 6 on the commissure.—Species 60, western North America. (From Greek loma, a border, referring to the winged fruit.)

Systematic note.—Correlated series of juvenile, flowering and fruiting specimens are a necessary desideratum for research on West American Lomatia,—necessary because such material must underlie any sound evaluation of specific units and any real understanding of geographic distribution. Of many species material is on the whole scanty, such as Lomatium austinae, L. plummerae, L. ciliolatum and L. rigidum. Some species simulate curiously species of other genera. Mainly by reason of lack of sufficient stages suitable for determination, specimens of such species are often found in wrong genus covers in herbaria. Lomatium torreyi resembles Cymopterus terebinthinus in habit and foliage, L. parryi simulates closely Cymopterus anisatus of Nevada in habit and foliage, L. piperi resembles Orogenia linearifolia of Oregon in its tubers, in habit and in foliage, and L. rigidum recalls vividly Cymopterus panamintensis (L. rigidum "is a Cymopterus panamintensis in everything but the fruit and another very interesting link between these closely related genera"—M. E. Jones, Contrib. W. Bot. 13:11). The life histories of L. congdonii, L. alatum, L. marginatum are all too slightly known.

I. Stems from a taproot.

A. Peduncles not enlarged at summit.

a. Fruit notched more or less deeply at each end, so that the wings on each side the body are more or less distinct; leaves with the leaflets more or less broad in outline.—Subgenus Euryptera.

Leaves ternate, the leaflets entire or merely toothed.
  Oil-tubes solitary in the intervals; wings of fruits twice as broad as body; coastal S. Cal.; Vaca Mts..........1. *L. lucidum.*
  Oil-tubes 3 in the intervals; wings of fruits slightly narrower than body; Del Norte Co..........2. *L. howellii.*
Leaves bipinnate, the leaflets ovate in outline, but usually much incised.
  Oil-tubes solitary in the intervals; South Coast Ranges..........3. *L. parvifolium.*
  Oil-tubes 3 in the intervals; Inyo Co..........4. *L. rigidum.*

b. Fruit not notched or scarcely so, the wings more or less joined above and below the body of the seed.

Leaves decompound, dissected into numerous very small segments.
  Leaves ternate or quinate, broad or roundish in outline.—Subgenus Eulomatium.
    Bractlets present.
      Bractlets broad, roundish or obovate; leaves ternate, then pinnately dissected; flowers yellow; widely distributed species.
        Oil-tubes none in the intervals or indistinct; wings of fruit narrower than body, thickish..........5. *L. caruifolium.*
        Oil-tubes solitary in the intervals; wings of fruit thin.
          Wings broader than body; body situated mostly above middle of fruit..........6. *L. vaseyi.*
          Wings equaling the body in breadth or narrower than body; body situated about middle of fruit..........7. *L. utriculatum.*
      Bractlets narrow, most often lanceolate.
        Bractlets not scarious-margined (sometimes inconspicuously so), often more or less united and unilateral.
          Fruit glabrous (rarely puberulent when young, becoming glabrate, especially on the wings); corolla glabrous; widely distributed species. 8. *L. macrocarpum.*
          Fruit pubescent; corolla with kinky white hairs.
            Pedicels mostly ½ inch or more long; wings of the fruit broad, membranous, thinly pubescent; Coast Ranges....9. *L. dasycarpum.*
            Pedicels mostly less than ½ inch long; wings of the fruit narrower, somewhat thickened, tomentose.
              Fruit large (6 to 8½ lines long), elliptic, the wings about as broad as the body; body broadly ovate, densely tomentose; Great Valley and Sierra foothills..........10. *L. tomentosum.*
              Fruit smaller (3 to 4½ lines long), broadly elliptic to orbicular, the wings narrower than the body; body oblong-elliptic, the intervals very dark and the ribs white-hairy; interior deserts and bounding ranges..........11. *L. mohavense.*
        Bractlets conspicuously scarious-margined.
          Herbage glabrous save the ciliolate leaf-margins..........12. *L. ciliolatum.*
          Herbage pubescent or puberulent; mostly summits and slopes towards the desert interior.

Flowers white or pale yellow.

Oil-tubes minute, 3 or more in the intervals; fruit ovate................ 13. *L. nevadense.*

Oil-tubes broad, 1 to 3 in the intervals; fruit oblong or oblong-ovate...14. *L. plummerae.*

Flowers purple; fruit elliptic; oil-tubes broad, 1 or 2 in the intervals.. 15. *L. austinae.*

Bractlets none (rarely 1 or 2); fruit wings somewhat narrower than the body; petioles dilated into narrow sheaths their whole length; s. Sierra Nevada.

Leaves ternate-pinnate; flowers yellow; pedicels 1 to 2 lines long; oil-tubes solitary. 16. *L. torreyi.*

Leaves quinate-pinnate; flowers whitish; pedicels 3 to 4 lines long; oil-tubes indistinct..17. *L. congdonii.*

Leaves pinnate, linear-lanceolate in outline; desert ranges.—Subgenus CYNOMARATHRUM.. 18. *L. parryi.*

Leaves with the divisions mostly few or at least not numerous, the leaflets narrow and much elongated.—Subgenus LONCHOPHYLLUM.

Leaflets or segments many, ⅙ to ½ line broad; n. Sierra Nevada foothills; oil-tubes very minute, sometimes forming (in cross-section) a continuous chain on the dorsal side. 19. *L. marginatum.*

Leaflets few, ½ to 1½ lines broad; oil-tubes very broad, solitary in the intervals; higher n. Sierra Nevada and n. Coast Ranges..20. *L. triternatum.*

B. PEDUNCLES ENLARGED AT SUMMIT.

Leaves with few divisions and broad leaflets; fruits very narrowly winged; bractlets none; flowers yellow; n. Cal.—Subgenus CRASSIPEDUNCULATUM..........................21. *L. nudicaule.*

II. Stems from a globose tuber; leaflets elongated; bractlets present; oil-tubes solitary in the intervals.—Subgenus COUS.

Flowers yellow; fruit linear, the wings ¼ to ⅓ as wide as the body; Modoc Co...22. *L. ambiguum.*

Flowers white; fruit elliptic, the wings ½ as wide as body; Sierra Co. to Siskiyou Co..................... 23. *L. piperi.*

1. **L. lucidum** Jepson. SAINTS PARSNIP. Plants ½ to 1½ feet high, glabrous, the stout peduncles from very short basal stems; leaves with 3 leaflets or the lowest ones ternate, each division with 3 leaflets; leaflets roundish to ovate, mucronate-toothed, not lobed or often 3-lobed or -parted, ¾ to 1¾ inches long; rays 10 to 15, 1 to 3 inches long; pedicels 3 to 6 lines long; involucels of lanceolate bractlets; flowers yellow; fruit nearly orbicular, emarginate at each end, glabrous, 4½ to 7½ lines long, with wings more than twice as broad as the narrowly oblong body, and prominent obtuse dorsal and intermediate ribs; oil-tubes solitary in the intervals, 2 to 4 on the commissure.

Open rocky ridges or chaparral burns, 1000 to 5000 feet: coastal Southern California from Los Angeles Co. to San Diego Co. Mar.-Apr., fr. May-June.

Locs.—San Gabriel foothills, *Hasse;* Pasadena, *McClatchie;* betw. Monrovia Cañon and Fish Cañon, San Gabriel Mts., *Peirson* 801; Lytle Creek, San Antonio Mts., *Hall* 1429; San Bernardino, *Parish* 3627; Aguanga, Riverside Co., *Jepson* 1484; Palomar, *Jepson* 1535; Del Mar, *Jepson* 1615.

Var. **repostum** Jepson. Leaves ternate, each division with 3 leaflets, or the central division with 9; leaflets ½ to ¾ inch long, finely toothed; body of carpel elliptic, the intervals often with secondary oil-tubes extending half the length.—Vaca Mts.; Cobb Mt., *M. S. Baker* 2287a.

Refs.—LOMATIUM LUCIDUM Jepson, Madroño 1:149, fig. 31 (1924), Man. 720, fig. 704 (1925). *Euryptera lucida* Nutt.; T. & G. Fl. 1:629 (1840), type loc. San Diego, *Nuttall;* Torr. Bot. Mex. Bound. 70, pl. 27 (1859); C. & R. Contrib. U. S. Nat. Herb. 7:241, fig. 61 (1900). *Peucedanum euryptera* Gray, Proc. Am. Acad. 7:348 (1868). *Cogswellia lucida* Jones, Contrib. W. Bot. 12:31 (1908). *Peucedanum hassei* C. & R. Bot. Gaz. 14:276 (1889), type loc. San Gabriel Mts., Los Angeles Co., *Hasse. Euryptera hassei* C. & R. Contrib. U. S. Nat. Herb. 7:242 (1900). Var. REPOSTUM Jepson, Madroño 1:149 (1924), type loc. Collins Spr., Vaca Mts., *Jepson* 14,309; Man. 720 (1925). *Peucedanum hassei* Jepson, Erythea 1:10 (1893), Fl. W. Mid. Cal. 358 (1901), ed. 2, 302 (1911).

PEUCEDANUM INSULARE Eastw. Proc. Cal. Acad. ser. 3, 1:106, pl. 8 (1898), type loc. San Nicolas Isl., *Blanche Trask. Euryptera insularis* C. & R. Contrib. U. S. Nat. Herb. 7:243 (1900); peduncles dilated at summit; involucre of a single elongated bract palmately divided at apex; involucels composed of several linear bractlets; oil-tubes usually 2 in the intervals, 6 on the commissure (ex char.).

2. **L. howellii** Jepson comb. n. Plants about 15 to 18 inches high, glabrous, the rather slender peduncles arising from very short (2 inches long) stems; leaves ternate, 2½ to 4½ inches long, the lateral divisions pinnate, the middle one ternate or pinnate; leaflets suborbicular to ovate, 4 to 9 lines long, often 3-parted, coarsely toothed, the teeth cuspidate; umbel 11 to 16-rayed, the rays 1 to 2¼ inches long; pedicels 3 to 4 lines long; fruit suborbicular, notched at both base and apex, 3½ to 4 lines long, the dorsal and lateral ribs obtuse, the wings slightly narrower than the body; oil-tubes 3 in the intervals, about 8 on the commissure.

Thinly forested hill slopes, 600 to 1400 feet: Del Norte Co. Fr. July.

Locs.—Adams Flat to Patrick Creek, *Jepson* 2913; Gasquet, *Peirson* 3948.

Refs.—LOMATIUM HOWELLII Jepson. *Peucedanum howellii* Wats. Proc. Am. Acad. 20:369 (1885), type loc. Waldo, Josephine Co., Ore., *Howell*. *Euryptera howellii* C. & R. Contrib. U. S. Nat. Herb. 7:243 (1900).

3. **L. parvifolium** Jepson. COAST PARSNIP. Plants 7 to 12 (or 18) inches high, the peduncles arising from short stems; stems erect, subterranean or to 5 inches high; herbage glabrous; leaves clustered near the base, bipinnate (but the upper leaflets confluent), 2 to 5 inches long; leaflets broad, irregularly incised and with broad strongly cuspidate teeth (3 or) 5 to 12 lines long; umbel 8 to 15-rayed, with involucels of linear or lanceolate acuminate bractlets; rays ¾ to 1¾ inches long; pedicels 2½ to 3½ lines long; flowers yellow; fruit broadly elliptical to orbicular, 2½ to 4 lines long, with wings broader than the body, and rather prominent dorsal and intermediate ribs; oil-tubes solitary in the intervals, 2 to 4 on the commissure.

Hill slopes and flats, 100 to 1200 feet: near the coast, Santa Cruz Co. to San Luis Obispo Co. Apr.-May, fr. June.

Locs.—Santa Cruz Mts. (w. of Gilroy), *Jepson* 14,310; Pajaro Hills, *Chandler* 406; Carmel, *Mason* 3992; San Simeon, *K. Brandegee;* Jolon, *T. Brandegee;* San Luis Obispo, *Jepson*.

Var. **pallidum** Jepson. Herbage very pale.—Santa Lucia Mts.: School Cañon, San Luis Obispo, *Condit*.

Refs.—LOMATIUM PARVIFOLIUM Jepson, Madroño 1:150 (1924), Man. 720 (1925). *Peucedanum parvifolium* T. & G. Fl. 1:628 (1840), type from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. 358 (1901), ed. 2, 301 (1911). *Ferula parvifolia* H. & A. Bot. Beech. 348 (1840). *Peucedanum californicum* C. & R. Bot. Gaz. 13:143 (1888), type loc. San Luis Obispo Co., *M. E. Jones*. *Euryptera parvifolia* C. & R. Contrib. U. S. Nat. Herb. 7:241 (1900). Var. PALLIDUM Jepson, Madroño 1:150 (1924), Man. 720 (1925). *Euryptera pallida* C. & R. l.c. 7:242 (1900), type loc. Santa Lucia Mts., *Vasey* 232. The spm. of *Vasey* 232 in the Kew Herbarium is labeled San Diego Co.

4. **L. rigidum** Jepson comb. n. Plants 4 to 10 inches high, the stout peduncles and the tufted leaves arising from a thick root-crown; herbage glabrous, glaucous; leaves 3 to 8 inches long, bipinnate, but the lower divisions elongated so that the leaves seem somewhat ternate; segments or leaflets broadly ovate, 4 to 6 lines long, deeply and unequally 3 to 5-cleft or -lobed, the lobes rigidly or spinescently 2 or 3-toothed; petioles ¾ to 3½ inches long; umbel 8 to 17-rayed; rays ½ to 1¾ inches long; pedicels 3 to 5 lines long; bractlets linear-lanceolate; flowers "apparently yellow"; fruit elliptic-ovate or oval, glabrous, 4 to 5 lines long, the wings about as wide as the body or slightly narrower; dorsal and lateral ribs very thin but prominent; oil-tubes 3 in the intervals, about 6 on the commissure.

Rocky places, 4000 to 6000 feet: western Inyo Co. Apr., fr. May.

Locs.—Big Pine; Andrews Camp, *K. Brandegee*.

Refs.—LOMATIUM RIGIDUM Jepson. *Cogswellia rigida* Jones, Contrib. W. Bot. 13:11 (1910), type loc. Big Pine, Inyo Co., *Hall & Chandler* 7225 (typ. vidi).

5. **L. caruifolium** C. & R. ALKALI PARSNIP. Peduncles 3 or 4, erect or diverging, 8 to 14 inches high, arising from the crown of a stout taproot; herbage glabrous or nearly so, or the foliage minutely pubescent; leaves ternately decompound, dissected into linear segments ¼ to ½ line wide and 1 to 4½ lines long; bractlets

distinct or nearly distinct, round-obovate to oblong, scarious-margined, entire or denticulate, usually acuminate, often shortly petiolate; rays often minutely scaberulous, the fertile 3 to 11, 1 to 3 inches long; pedicels in fruit 1¼ to 3 lines long; fruits glabrous, suborbicular or elliptic, 2½ to 4½ lines long, the wings ½ to almost as wide as the body; oil-tubes none on the commissure, none in the intervals or indistinct, but often with 2 or 3 obscure or superficial minor ridges.

Wet or alkali soil, 20 to 4100 feet: Sonoma Co.; South Coast Ranges from Contra Costa Co. to San Luis Obispo Co.; Great Valley. Mar.-Apr., fr. Apr.-June.

Locs.—Sonoma Co.: Windsor, *Jepson* 9297. South Coast Ranges: Hunter Pt., San Francisco, *Jepson* 12,728; Los Buellis Hills, Santa Clara Co., *R. J. Smith;* Paso Robles, *Georgiana P. Ballard;* Carrizo Plain, se. San Luis Obispo Co., *Jepson* 12,007. Great Valley: Yolo Co., *Blankinship;* Little Oak, Vacaville, *Jepson* 14,283; Byron, *Greene;* Exeter, Tulare Co. (Contrib. U. S. Nat. Herb. 7:217).

Var. **denticulatum** Jepson. Stout, 13 to 16 inches high; leaf-segments broader; rays unequal, the fertile 2½ to 5½ inches long; wing-margins roughened or denticulate.—Exeter, Tulare Co.

Var. **solanense** Jepson. Rachises and leaf-segments seabridulous-puberulent.—Cannon sta., Solano Co.

Var. **erythropodum** Jepson var. n. Stylopodiums conspicuously dark purple.—(Stylopodia conspicue atropurpurea.)—Sandy hillocks on the plain of the San Joaquin Valley at Califa, Madera Co., *Jepson* 15,171 (type).

Refs.—LOMATIUM CARUIFOLIUM C. & R. Contrib. U. S. Nat. Herb. 7:216 (1900); Jepson, Man. 720, fig. 705 (1925). *Ferula caruifolia* H. & A. Bot. Beech. 348 (1840), type from Cal., *Douglas. Peucedanum caruifolium* T. & G. Fl. 1:628 (1840); Jepson, Fl. W. Mid. Cal. 359 (1901), ed. 2, 303 (1911). *Cogswellia caruifolia* Jones, Contrib. W. Bot. 12:34 (1908). *C. caruifolia* var. *patens* Jones, l.c. 12:41 (1908), type loc. Tehachapi, *Jones;* oil-tubes evident, 2 to 4 in the intervals (ex char.). Var. DENTICULATUM Jepson, Madroño 1:151 (1924), Man. 721 (1925). *Peucedanum erosum* Jepson, Erythea 5:1 (1897), type loc. Exeter, *Eastwood.* Var. SOLANENSE Jepson, Madroño 1:151 (1924), type loc. Cannon sta., Solano Co., *Jepson* 6785; Man. 721 (1925). Var. ERYTHROPODUM Jepson.

6. **L. vaseyi** C. & R. RANGE HOG-FENNEL. Peduncles ascending, 6 to 12 inches high, arising from the short stems of the root-crown, naked or frequently with 1 or 2 leaves; foliage minutely puberulent, the plant otherwise mostly glabrous; leaves ternate-pinnate, the divisions pinnately cut into linear-oblong segments 1½ to 3 lines long and ½ to 1 line broad; petioles inflated, ½ to 1 inch long; rays 5 to 14, the fertile ½ to 2 inches long; pedicels 1 to 2 lines long; bractlets cuneate-obovate to oblanceolate, laciniate-toothed at apex or abruptly acuminate; flowers yellow; fruit elliptic or slightly narrowed towards the base, 4 to 7 lines long, 3 to 4½ lines wide, the body situated mostly above the middle, only about 1 line wide and half as long as the fruit but contracted at base into a stipe-like process, and at apex into a beak-like process, the whole with broad wings broader than the body; dorsal and intermediate ribs obvious, with broad solitary oil-tubes in the intervals, 4 on the commissure.

Dry mesas and mountain slopes, 1200 to 5500 feet: coastal Southern California; desert ranges in Inyo Co.; Tehachapi Mts.; Sierra Nevada from Kern Co. to Eldorado Co.; inner South Coast Range; middle and inner North Coast Ranges from Napa Co. to Siskiyou Co. Apr., fr. May-June.

Locs.—S. Cal.: El Cajon, San Diego Co., *T. Brandegee;* San Timoteo Cañon, Redlands, *Jepson* 6079; San Bernardino, *Parish* 3628. Inyo Co.: Darwin Mesa (Contrib. U. S. Nat. Herb. 4:116). Tehachapi Range: Keene, *Jepson* 7157. Sierra Nevada: Rock Pile, se. of Bakersfield (hills near), *Davy* 1870; Kaweah, *Eastwood;* North Fork, Madera Co., *Jepson* 12,875; Alder Creek, Yosemite, *Jepson* 4317; Bower Cave, Mariposa Co., *Jepson* 14,313; Pine Log, Tuolumne Co., *A. L. Grant* 692; Columbia, *Jepson* 6291; New York Ravine, Eldorado Co., *K. Brandegee.* Inner South Coast Range: Los Gatos Creek (head of), w. Fresno Co., *Jepson* 12,197. North Coast Ranges: Napa Range near Calistoga, *Jepson* 14,311; Stonyford, w. Colusa Co., *Jepson* 16,281; Edgewood, Siskiyou Co., *Curran.*

Refs.—LOMATIUM VASEYI C. & R. Contrib. U. S. Nat. Herb. 7:216 (1900); Jepson, Man. 721 (1925). *Peucedanum vaseyi* C. & R. Bot. Gaz. 13:144 (1888), type loc. San Bernardino Mts., *Vasey* 231; Jepson, Fl. W. Mid. Cal. 359 (1901), ed. 2, 302 (1911). *Cogswellia vaseyi* C. & R. Contrib. U. S. Nat. Herb. 12:451 (1909). *C. caruifolia* var. *vaseyi* Jones, Contrib. W. Bot. 12:41

(1908). *C. chandleri* Jones, Contrib. W. Bot. 13:11 (1910), type loc. Nelson Range, Inyo Co., *Hall & Chandler* 7157; while the type specimens are only in flower and very young fruit, comparison seems to show rather conclusively that this binomial must be a synonym of L. vaseyi. *L. chandleri* Mcbr. Contrib. Gray Herb. 53:15 (1918).

7. **L. utriculatum** C. & R. Bladder Parsnip. Plants 8 to 12 inches high, the peduncles from short stems or from the root-crown, usually glabrous except the minutely puberulent leaves; leaves ternate, then pinnately decompound and dissected into linear segments 1 to 3 lines long; petioles conspicuously inflated, membranous, 3 to 7 lines broad; umbellets in flower hemispherical or just a little more than a hemisphere; rays 3 to 15, very unequal, the fruiting ones ½ to 2 (or 3) inches long; fruiting pedicels 2 to 6 lines long; involucre none or occasionally with 1 often foliaceous bract; bractlets round-obovate to oblanceolate, entire, toothed or laciniate, usually acuminate, short-petiolate, equaling the yellow flowers; fruits narrowly elliptic, 2¼ to 4 (or 5½) lines long; wings as broad as or narrower than body; oil-tubes 4 to 6 on the commissure, 1 in each interval or with short accessory ones in the dorsal intervals.

Open grassy hill slopes or plains, 20 to 3000 (4600) feet: Southern California from the San Bernardino Valley to Mt. Piños region; Inyo Co.; Sierra Nevada from Fresno Co. to Lassen Co.; Coast Ranges from San Luis Obispo Co. to Humboldt Co.; Sacramento Valley. North to British Columbia. Feb.-Apr., fr. May-July.

Locs.—S. Cal.: West Riverside, *Hall;* San Bernardino, *S. B. & W. F. Parish;* San Rafael Mts., *Hall* 7802; Cuddys, Mt. Pinos region, *Dudley & Lamb* 4509. Desert region: Argus Mts., *Purpus* 5439. Sierra Nevada: Table Mt., Fresno Co., *Jepson* 15,126; Ackerson Mdws., Tuolumne Co., *Munz* 7423; New York Ravine, Eldorado Co., *K. Brandegee;* Oroville, *Heller* 11,259; Madeline Plains, Lassen Co., *C. C. Bruce* 2286. Coast Ranges: Ft. Tejon, *Davy* 2351; Yeguas Hills, n. end Carrizo Plain, se. San Luis Obispo Co., *Jepson* 16,205a; Coyote, Santa Clara Valley, *Jepson* 14,290; Berkeley, *Jepson* 7677, 14,288; Atlas Peak, Napa Range, *Mary Ferguson* 203; Vaca Mts., *Jepson* 14,291; Bear Valley, w. Colusa Co., *Jepson* 8968; South Yager Creek, Humboldt Co., *Tracy* 6525 (intermediate to var. anthemifolium); South Fork Mt., w. Trinity Co., *Jepson* 16,674. Sacramento Valley: Rio Linda, n. Sacramento Co., *Jepson* 16,593; College City, *Alice King;* Redding, *Blankinship.*

Var. **glabrum** Jepson. Herbage glabrous.—Alcalde, w. Fresno Co., *Eastwood;* Caliente, Kern Co., *T. Brandegee;* Tehachapi, *T. Brandegee;* Seymour Creek, Mt. Pinos, Ventura Co., *Hall* 6339; Manzana, *Davy* 2357.

Var. **anthemifolium** Jepson var. n. Plants usually taller than in the species, 18 to 24 inches high; ultimate leaf-segments very narrowly linear or subfiliform; fruits smaller (2½ lines long).—(Plantae altiora; foliorum segmenta angustiora; carpella minora.)—Mendocino Co. (Covelo, *Eastwood* 15,816); Humboldt Co. (Redway, South Fork Eel River, *Jepson* 16,716, type; Dinsmore Ranch, opp. Buck Mt., *Tracy* 4209).

Refs.—LOMATIUM UTRICULATUM C. & R. Contrib. U. S. Nat. Herb. 7:215 (1900); Jepson, Man. 721 (1925). *Peucedanum utriculatum* Nutt.; T. & G. Fl. 1:628 (1840), type loc. plains near junction of the Willamette and Columbia rivers, Ore., *Nuttall;* Jepson, Fl. W. Mid. Cal. 359 (1901), ed. 2, 303 (1911). *Cogswellia utriculata* Jones, Contrib. W. Bot. 12:34 (1908). Var. GLABRUM Jepson, Madroño 1:152 (1924), type loc. Alcalde, w. Fresno Co. Var. ANTHEMIFOLIUM Jepson.

8. **L. macrocarpum** C. & R. Sheep Parsnip. Plants ¾ to 1 (or 2¾) feet high, the peduncles several from a short scaly caudex; herbage thinly short-pubescent; leaves in a basal or sub-basal tuft, 2 to 5 inches long, or the earliest often as much as 1 foot long, once or twice ternate, and twice pinnately divided, the segments linear, acute, ½ to 2½ lines long, the ultimate divisions of the rachis winged; fruiting rays about equal, ½ to 4 inches long; pedicels 2½ to 4½ lines long; involucel of many lanceolate bractlets mostly exceeding the umbellets, sometimes united at base and unilateral; flowers dull white or pale yellow; corolla glabrous; ovary glabrous or sometimes puberulent; fruit oblong to ovate, mostly narrow, but sometimes very broad and somewhat quadrangular, 5½ to 8 (or 10) lines long, 2 to 3½ lines wide, the dorsal and intermediate ribs obvious or sometimes inconspicuous; oil-tubes 1 to each interval, 2 to 6 on the commissure, the seed sharply channeled beneath those of the dorsal intervals; wings broader or sometimes narrower than the body.

Open stony hills, 20 to 6800 feet: Sierra Nevada from Kern Co. to Lassen Co.; Coast Ranges from Kern Co. to Siskiyou Co. North to Washington, east to Colorado. Apr.-May, fr. May-July.

Locs.—Sierra Nevada: Greenhorn Range, Kern Co., *Hall & Babcock* 5076; Alder Creek, Yosemite, *Jepson* 4318; Mariposa, *Congdon;* Cold Spr., Tuolumne Co., *Jepson* 6460; Honey Lake, *T. Brandegee;* Olinda, Shasta Co., *Blankinship.* South Coast Ranges: San Emigdio Cañon, sw. Kern Co., *Davy* 2071; Jolon, Monterey Co., *Eastwood;* Pico Blanco, Santa Lucia Mts., *Davy* 7332; Coyote sta., Santa Clara Valley, *Jepson* 14,297; Redwood City, *Jepson* 5736, 5738; Mt. Diablo, *Jepson* 3120; Antioch, *Curran.* North Coast Ranges: Sonoma Valley, *Jepson* 4184; Vanden, Solano Co., *Jepson* 14,809; Weldon Cañon, Vaca Mts., *Jepson* 7197; Howell Mt. foothills, *Jepson* 14,384; Asa Bean Ridge, ne. Mendocino Co., *Jepson* 14,295; South Yollo Bolly, se. Trinity Co., *Jepson* 14,296; Crane Creek, w. Tehama Co., *Jepson* 14,294; Devils Backbone, sw. Siskiyou Co., *Jepson* 2103; Yreka, *Butler* 744.

Var. **douglasii** Jepson. Leaf-segments larger, as much as 4½ lines long and 1 line wide; umbel sometimes with a single bract.—California, *Douglas.*

Var. **ellipticum** Jepson. Root-crown bearing short leafy branches; leaf-segments oblong, cuspidate; fruit broadly elliptical, notched at base and apex, 9½ lines long and 4½ lines broad, the wings twice as wide as the body; dorsal and intermediate ribs obscure or filiform.—Feather River near Marysville, *Bigelow;* region of the "head waters of the Sacramento" (Pit River branch), *Snyder.*

Refs.—LOMATIUM MACROCARPUM C. & R. Contrib. U. S. Nat. Herb. 7:217 (1900); Jepson, Man. 721 (1925). *Peucedanum macrocarpum* Nutt.; T. & G. Fl. 1:627 (1840), type loc. Columbia River, Ore., *Nuttall;* Jepson, Fl. W. Mid. Cal. 358 (1901), ed. 2, 302 (1911). *Cogswellia macrocarpa* Jones, Contrib. W. Bot. 12:33 (1908). Var. DOUGLASII Jepson, Madroño 1:153 (1924), type from Cal., *Douglas;* Man. 722 (1925). Var. ELLIPTICUM Jepson, Madroño 1:153 (1924), Man. 722 (1925). *Peucedanum nudicaule* var. *ellipticum* T. & G. Pac. R. Rep. 2:121 (1855), type loc. "Round Valley near the sources of the Sacramento", that is, on Pit River branch, *Snyder. Lomatium ellipticum* C. & R. l.c. 7:217 (1900).

9. **L. dasycarpum** C. & R. LACE PARSNIP. Plants 1 to 1½ feet high, the peduncles arising from the root-crown or from very short stems; herbage puberulent or pubescent, peduncles and wings of carpels often purplish; leaves ternately decompound and dissected into oblong or linear segments, these 1 to 2 or 3 lines long; umbels somewhat equally 6 to 15-rayed; rays 1 to 2 inches long; bractlets linear to ovate, more or less tomentose; pedicels in fruit about ½ inch long, usually longer than the carpels; flowers white; fruit purplish or whitish, broadly elliptic to orbicular, with subcordate base, 3½ to 4 (or 7) lines long, the wings thin-membranaceous, 2 to 3 times the width of the very narrow or somewhat spindle-shaped body; body commonly very woolly when young, more or less glabrate in age; oil-tubes usually 1 in the intervals (often a second one in the lateral intervals), 2 to 4 on the commissure.

Dry hillsides and mesas, 200 to 2000 (or 4000) feet: coastal Southern California; South Coast Ranges from San Benito Co. to Contra Costa Co. Feb.-Apr., fr. May-June.

Note on variation.—The prevailing plant of the South Coast Ranges is here taken as typical of the Douglas type of Lomatium dasycarpum. This usual form has the ultimate leaf-segments oblong to broadly linear and ½ to 1 line long, and the oil-tubes commonly 1 in the intervals. The reddish wings of the fruit develop early, are only slightly pubescent and thus differ markedly from the tomentulose or pubescent body. The number of oil-tubes is not, however, constant, usually not even in a single individual, and hence is not a critical differentia. It will thus be seen from the specimens cited below that, as we proceed northward in the South Coast Ranges, the oil-tubes are more frequently 2 or 3 in the intervals, 1 oil-tube being less commonly found. The plants of the North Coast Ranges have most commonly 2 or 3 oil-tubes in the intervals; in addition the bractlets are usually more strongly developed (mostly broadly ovate) and the body of the carpel is broader, nearly equaling the wings in breadth. These northern plants we cite under var. medium Jepson. In habit, foliage, pedicels, in size of fruit and thinness of wings the var. medium is more closely associated with L. dasycarpum than with L. tomentosum, although in character of the oil-tubes it may be regarded as intermediate between these two species. As here accepted L. tomentosum is restricted geographically to the area of the Great Valley and Sierra Nevada foothills. It has linear or filiform leaf-segments (1½ to 2 lines long) and larger fruits (6 to 7 lines long); the ovary is densely woolly, but by the time it is half grown the wings are often still inconspicuous, so tardily do they develop.

Locs.—Coastal S. Cal.: Stonewall Mine, Cuyamaca Mts., *Parish* 4419; San Diego, *Hall* 3936; Thomas Valley, San Jacinto Mts., *Jepson* 1471; San Rafael Hills near Pasadena, *Ottley* 632; Los Angeles, *Davidson* (oil-tubes 1 in the dorsal intervals, 2 or 3 in the lateral, 4 on the commissure); Lukens Peak, San Gabriel Mts., *Peirson* 338; Saugus, *K. Brandegee* (oil-tubes 1 in the intervals, 4 on the commissure); Santa Inez Mts., *Hall* 7850 (oil-tubes 1 in the dorsal intervals, 2 in the lateral, 4 on the commissure), *T. Brandegee* (oil-tubes 1 in the intervals, 2 on the commissure). South Coast Ranges: Merrill Valley, s. San Benito Co., *Hall* 9923 (oil-tubes 1 or 2 in the dorsal intervals, 2 in the lateral, 2 or 4 on the commissure); Santa Cruz Mts. betw. Gilroy and Corralitos, *Jepson* 14,300 (oil-tubes 2 in the intervals, 2 on the commissure); Redwood City, *Jepson* 5739 (fl.), *Elena R. Goodwin* (oil-tubes 1 in the dorsal intervals, 2 in the lateral, 2 on the commissure); Mt. Diablo, *Jepson* 7579 (oil-tubes 1 in the dorsal intervals, 2 in the lateral, 2 on the commissure); South San Francisco, *Eastwood* (oil-tubes 1 or 2 in the dorsal intervals, 2 or 3 in the lateral, 2 or 4 on the commissure); San Francisco, *Jepson* 14,305.

Var. **medium** Jepson. Bractlets broadly ovate mostly; body of carpel broader; oil-tubes commonly 2 or 3 in the intervals.—Dry gravelly soil or serpentine outcrops, 200 to 3000 feet: North Coast Ranges from Marin Co. to Humboldt Co. Mar.-Apr., fr. May-July.

Locs.—Ross Valley, Marin Co., *Jepson* 14,306 (oil-tubes 2 in the intervals, 4 on the commissure); Mt. Tamalpais, *Jepson* 1192c; Napa, *Jepson* 14,304 (oil-tubes 2 or 3 in the dorsal intervals, 2 in the lateral, 4 on the commissure); Conn Valley, Napa Range, *Jepson* 14,303 (oil-tubes 2 or 3 in the dorsal intervals, 1 in the lateral, 2 on the commissure); Howell Mt., *Jepson* 517; Vaca Mts., *Jepson* 14,302 (oil-tubes 2 or 3 in the dorsal intervals, 2, 3, or 4 in the lateral, 4 on the commissure); Mayacamas Range (e. of Ukiah), *Jepson* 3012; Indian Valley, ne. Lake Co., *Jepson* 8990 (oil-tubes 2 or 3 in the intervals); Mail Ridge, s. Humboldt Co., *Jepson* 1891; ridge betw. Van Duzen and Mad Rivers, *Tracy* 2890 (oil-tubes 3 in the intervals, 4 on the commissure); Bluff Creek, Klamath River, n. Humboldt Co., *Chandler* 1445 (oil-tubes 2 or 3 in the dorsal intervals, 2 in the lateral, 4 on the commissure); Burnt Ranch, Trinity Co., *Tracy* 6403.

Var. **decorum** Jepson. Procumbent peduncles with white flowers; erect peduncles with lilac-purple flowers.—San Carlos Range. Apparently the procumbent white-flowered peduncles later become erect and the flowers change in color to lilac-purple.

Refs.—LOMATIUM DASYCARPUM C. & R. Contrib. U. S. Nat. Herb. 7:218 (1900); Jepson, Man. 722, fig. 706 (1925). *Peucedanum dasycarpum* T. & G. Fl. 1:628 (1840), type from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. 358 (1901), ed. 2, 302 (1911). *Cogswellia dasycarpa* Jones, Contrib. W. Bot. 12:34 (1908). *Peucedanum pringlei* C. & R. Bot. Gaz. 13:209 (1888), type loc. San Diego, *Pringle.* Var. MEDIUM Jepson, Madroño 1:154 (1924), type loc. Conn Valley, Napa Co., *Jepson* 14,303; Man. 722 (1925). Var. DECORUM Jepson, Madroño 1:154 (1924), type loc. North Fork Lewis Creek, San Carlos Range, *Jepson* 2704; Man. 722 (1925).

10. **L. tomentosum** C. & R. PLAINS PARSNIP. Plants 12 to 20 inches high, the peduncles and leaves basal or sub-basal, borne on very short (¼ to 1½ inches) stems; herbage tomentulose; leaves 2 to 5 inches long, ternately decompound into filiform segments; umbels 10 to 20-rayed, the rays 1½ to 2½ inches long; pedicels mostly shorter than the carpels; flowers white; bractlets ovate, acuminate; ovaries heavily clothed in white wool; fruit large, elliptic, 6 to 8½ lines long, usually densely tomentose, the wings little if at all wider than the broadly ovate body; oil-tubes usually 2 or 3 in the intervals, 2 or 4 on the commissure.

Clay plains and stony hill slopes, 50 to 4000 feet: inner North Coast Range and its eastern-bordering plain from Tehama Co. to Solano Co.; Sierra Nevada foothills and western-bordering plain from Butte Co. to Mariposa Co.; Tehachapi Mts. Apr., fr. May-June.

Locs.—Inner North Coast Range and its bordering plain: Redding, *Blankinship;* Anderson, Shasta Co., *Blankinship;* Dibble Creek, w. Tehama Co., *Jepson* 14,292; Rockville, w. Glenn Co., *Jepson* 16,307; Elmira, *Curran* (oil-tubes 2 or 3 in the intervals, 2 on the commissure). Sierra Nevada foothills: Olinda, Shasta Co., *Blankinship;* Green Gulch, Mariposa Co., *Congdon* (oil-tubes 2 or 3 in the intervals, 2 on the commissure). Tehachapi Mts.: Tehachapi, *K. Brandegee* (oil-tubes 2 in the intervals).

Refs.—LOMATIUM TOMENTOSUM C. & R. Contrib. U. S. Nat. Herb. 7:219 (1900); Jepson, Man. 722 (1925). *Peucedanum tomentosum* Benth. Pl. Hartw. 312 (1849), type loc. "Sacramento Valley, *Hartweg* 257", in Butte Co. (Erythea 5:55). *Cogswellia tomentosa* Jones, Contrib. W. Bot. 12:35 (1908).

11. **L. mohavense** C. & R. MOHAVE PARSNIP. Low plants (7 to 10 inches high), the stout peduncles ascending from the root-crown, not much exceeding the leaves; whole plant hoary with a short pubescence; leaves pinnately decompound,

the segments crowded, obovate or oblong, ⅕ to ½ (or 1½) lines long; flowers black-purple; umbel somewhat unequally 6 to 12 (or more)-rayed; involucels inconspicuous, consisting of small linear-lanceolate acuminate bractlets; umbellets very numerous; fruit broadly elliptic to almost orbicular, 3 to 4½ lines long, the wings not as broad as the body; oil-tubes usually 3 or 4 (sometimes 2 or 5) in the intervals with 4 to 8 on the commissure.

Dry plains and hill slopes, 2100 to 6000 (or 11,000) feet: Colorado Desert (west side); Mohave Desert and its bordering ranges; north to Inyo Co. Apr.-May, fr. May-Aug.

Locs.—Blair Valley, e. San Diego Co., *Jepson* 8673; betw. Thomas Valley and Vandeventer ranch, San Jacinto Mts., *Jepson* 1332; Antelope Valley, *Davidson;* Manzana, *Davy* 2623; Amargo, *Jepson* 15,589; Stoddard Well, *Jepson* 5923; Ord Mt., *Jepson* 5868; Kramer, *Jepson* 5346; Mt. Pinos, *Hall* 6516; Walker Pass, *Purpus* 5352; Campito Mt., White Mts., *Jepson* 7281.

Refs.—LOMATIUM MOHAVENSE C. & R. Contrib. U. S. Nat. Herb. 7:234 (1900); Jepson, Man. 722, fig. 707 (1925). *Peucedanum mohavense* C. & R. Rev. N. A. Umbell. 62 (1888), type loc. Yucca, Mohave Desert, *Curran. Cogswellia mohavensis* Jones, Contrib. W. Bot. 12:34 (1908). *Peucedanum argense* Jones, l.c. 8:30 (1898); type loc. Lone Pine, Inyo Co., *Jones. Lomatium argense* C. & R. Contrib. U. S. Nat. Herb. 7:234 (1900).

12. **L. ciliolatum** Jepson. Peduncles and leaves from the crown of the taproot; peduncles spreading, 1½ to 4 inches long; whole plant glabrous except the margins of the leaves which are finely and regularly ciliolate; leaves ovatish in outline, ¾ to 1¼ inches long, simply pinnate, the leaflets ¼ to ¾ inch long, irregularly pinnatifid into ovatish segments; rays 3 to 5, unequal, ¼ to 1¼ inches long; pedicels ½ to 1 line long; involucre none; involucels of several ovate bractlets with dark purple veins; fruit elliptic, glabrous, 3½ to 4 lines long; lateral ribs with narrow wings (about ¼ line wide); dorsal and intermediate ribs filiform, inconspicuous, the dorsal and lateral intervals with 3 or 4 striae; oil-tubes obscure, 4 or 5 in the intervals, 2 on the commissure.

Montane slopes, 6000 to 7000 feet: Yollo Bolly Mts. Fr. July.

Refs.—LOMATIUM CILIOLATUM Jepson, Madroño 1:155 (1924), type loc. Soldier Ridge near South Yollo Bolly, *Jepson* 14,319; Man. 723 (1925).

13. **L. nevadense** C. & R. BASIN PARSNIP. Plants 4 to 7 inches high, the peduncles ascending from very short erect stems rising from the root-crown; herbage, rays and pedicels minutely pubescent; leaves decompound, the ultimate divisions pinnately divided into acute segments 1 to 2 lines long; umbels compact or subcapitate in flower, unequally 3 to 5-rayed, the rays elongating in fruit and becoming ½ to 4 inches long; bractlets ovate to linear-lanceolate, scarious-margined, distinct or united at base; pedicels 1¾ to 4 lines long; flowers white with pubescent ovaries; fruit ovate, acute, minutely pubescent, 3 to 5 lines long, the wings narrower than or almost as broad as the body; ribs on the back very fine or somewhat obscure, sometimes with supplementary striae in the intervals; oil-tubes 3 or 4 in the intervals, 4 to 6 on the commissure.

Sandy or rocky exposed slopes, 4000 to 9600 feet: east side or easterly crests of the Sierra Nevada from Tuolumne Co. to Modoc Co. North to Oregon, east to Utah and Arizona. May-June, fr. Aug.

Locs.—Sonora Pass, *A. L. Grant* 356; Prosser Creek, Nevada Co., *Sonne;* Martis Creek, Truckee, *Sonne;* Forestdale region, sw. Modoc Co., *M. S. Baker;* Goose Lake Valley, *R. M. Austin.*

Var. **parishii** Jepson. Ultimate leaf-segments 2 to 4 lines long, or often elongated-linear and up to 12 lines long; involucel unilateral, deeply toothed; pedicels ½ to 3 lines long; ovaries and fruit glabrous; fruit round-ovate to narrowly or broadly elliptic, 3½ to 5 lines long; wings usually narrower than the body; ribs filiform, often with 3 or 4 supplementary striae of the same size in the intervals; oil-tubes exceedingly small, several in the intervals.—Dry rocky soil, 5000 to 8600 feet: desert ranges in Inyo Co. and in and bordering the western Mohave Desert.

Locs.—Templeton Mt., Tulare Co., *Jepson* 4973 (on about 100 acres of the flats near the mountain it is the dominant species); Lone Pine, *Hall & Chandler* 7205; Piute Peak, Kern Co., *Purpus* 5288; Nelson Range, Inyo Co., *Hall & Chandler* 7155; Hanaupah Cañon, Panamint Range, *Jepson*

7048; Ord Mt., *Jepson* 5881; Bear Valley, *Parish* 1828; Lytle Creek, San Antonio Mts., *Hall* 1442; Rock Creek, San Gabriel Mts., *Peirson* 473.

Var. **holopterum** Jepson. Similar to the var. parishii; more finely puberulent; lateral wings of fruit broader (1 to 1¼ lines broad, commonly almost as broad as the body), straw-color; intermediate and dorsal ribs filiform but more evident; oil-tubes showing markedly from the outside.—Eastern Mohave Desert: Bonanza King Mine, Providence Mts., *Munz, Johnston & Harwood* 4236; Barnwell, New York Mts., *K. Brandegee.*

Refs.—LOMATIUM NEVADENSE C. & R. Contrib. U. S. Nat. Herb. 7:220 (1900); Jepson, Man. 723 (1925). *Peucedanum nevadense* Wats. Proc. Am. Acad. 11:143 (1876), type loc. Unionville, Nev., *Watson* 469. *Cogswellia nevadensis* Jones, Contrib. W. Bot. 12:33 (1908). Var. PARISHII Jepson (by error "Jones"), Madroño 1:156 (1923), Man. 723 (1925). *Peucedanum parishii* C. & R. Bot. Gaz. 13:209 (1888), type loc. Bear Valley, San Bernardino Mts., *Parish* 1828. *L. parishii* C. & R. Contrib. U. S. Nat. Herb. 7:235 (1900). *Cogswellia nevadensis* var. *parishii* Jones, Contrib. W. Bot. 12:33 (1908). Var. HOLOPTERUM Jepson, Madroño 1:156 (1924), type loc. Bonanza King Mine, Providence Mts., *Munz, Johnston & Harwood* 4236; Man. 723 (1925).

14. **L. plummerae** C. & R. Love Parsnip. Plants 8 to 12 inches high, the peduncles stoutish, widely spreading, arising from very short stems; herbage glabrous and somewhat glaucous; leaves ternately decompound, 2 to 5¼ inches long, the numerous crowded ultimate segments very small, oblong (¾ to 1½ lines long), sometimes more or less confluent; umbel very unequally 6 to 12-rayed, with involucels of numerous lanceolate acuminate bractlets; rays ¼ to 1½ inches long; pedicels 1 to 4 lines long; flowers white; fruit oblong or oblong-ovate, usually acute at apex, glabrous, 3½ to 4 lines long, 1¾ to 2¼ lines broad, with wings half to as broad as the body, and indistinct dorsal and intermediate ribs; oil-tubes 1, 2 or 3 in the intervals, 4 to 6 on the commissure.

Flats and hills, 3000 to 5000 feet: east side or easterly valleys of the northern Sierra Nevada from Sierra Co. to Siskiyou Co. Apr., fr. May-June.

Locs.—Sierra Valley, *Lemmon* 32; Marston sta., Plumas Co., *Heller* 10,838; "near Shasta, *Lemmon*" (Contrib. U. S. Nat. Herb. 7:232), (by "Shasta" Lemmon undoubtedly meant Mt. Shasta).

Var. **sonnei** Jepson. Flowers yellow; oil-tubes 1 or 2 in the intervals.—Sandy soil, among sagebrush, 4000 to 5000 feet: eastern Nevada Co.; thence east to Washoe Co., Nev.

Refs.—LOMATIUM PLUMMERAE C. & R. Contrib. U. S. Nat. Herb. 7:232 (1900); Jepson, Man. 723 (1925). *Peucedanum plummerae* C. & R. Bot. Gaz. 14:278 (1889), type loc. Sierra Valley, *Lemmon* 32. *Cogswellia plummerae* Jones, Contrib. W. Bot. 12:34 (1908). Var. SONNEI Jepson, Madroño 1:157 (1924), Man. 724 (1925). *Lomatium sonnei* C. & R. Contrib. U. S. Nat. Herb. 7:236 (1900), type loc. Verdi, w. Nev., *Sonne.*

15. **L. austinae** C. & R. Plumas Parsnip. Plants 9 inches high, the peduncles arising from short stems; herbage puberulent; leaves 1¾ to 3 inches long, decompound, the ultimate divisions pinnately cleft into oblong segments, the segments ½ to 1¼ lines long; flowers purplish; fruit glabrous, 3 lines long, 1¼ lines broad; oil-tubes very broad, solitary in the dorsal intervals, mostly 2 in the lateral, 4 on the commissure.

Montane flats, 3000 to 5000 feet: Sierra Nevada from Plumas Co. to Siskiyou Co. May, fr. June.

Locs.—Mohawk Valley, *Lemmon;* Yreka (Contrib. U. S. Nat. Herb. 7:236).

Refs.—LOMATIUM AUSTINAE C. & R. Contrib. U. S. Nat. Herb. 7:236 (1900); Jepson, Man. 724 (1925). *Peucedanum austinae* C. & R. Bot. Gaz. 13:208 (1888), type loc. Big Mdws., Plumas Co., *R. M. Austin. Cogswellia austinae* Jones, Contrib. W. Bot. 12:35 (1908).

16. **L. torreyi** C. & R. Sierra Parsnip. Plants 3 to 10 inches high, the peduncles and leaves arising from the subterranean root-crown; peduncles slender, densely clothed at base with old straw-color petioles; herbage glabrous; leaves 2 to 5 inches long, ternate-pinnate or -bipinnate, the ultimate segments linear, cuspidulate, 1 to 3 lines long; umbel unequally few-rayed, the rays ½ to 1½ inches long; bractlets none, or 1 or 2 and small; pedicels 1 to 2 lines long; flowers yellow; calyx-teeth small or obsolete; fruit narrowly oblong to linear, truncatish at base, 4 to 6 lines long, with wings not half as broad as the body; oil-tubes solitary in the intervals.

Clefts of granite rocks, 6000 to 10,000 feet: Sierra Nevada, Mariposa Co. to Tulare Co. June, fr. Aug.

Locs.—Mary Lake, near Tower Peak, *Jepson* 4555; White Cascade, Tuolumne River, *Duran* 1201; Lake Merced, Yosemite Park, *Jepson* 3207; Eagle Peak trail to El Capitan, Yosemite, *Jepson* 4368; Merced Grove, *Jepson* 14,261; Muir Pass, Fresno Co., *E. Ferguson* 493; Scepter Pass, betw. Tehipite Valley and Huntington Lake, *E. Ferguson* 549; Alta Mdws., Tulare Co., *K. Brandegee;* Mt. Moses, *Purpus* 1531.

Refs.—Lomatium torreyi C. & R. Contrib. U. S. Nat. Herb. 7:229 (1900); Jepson, Man. 724 (1925). *Peucedanum torreyi* C. & R. Bot. Gaz. 14:276 (1889), type loc. "Yosemite", *Curran. Cogswellia torreyi* Jones, Contrib. W. Bot. 12:35 (1908).

17. **L. congdonii** C. & R. Mariposa Parsnip. Plant 6 to 9 inches high, the peduncles ascending from the basal tuft of leaves; herbage glabrous; leaves first palmately quaternate or quinate (1 or 2 of the divisions small), then bi- or tripinnate, the rachises more or less scaberulous; ultimate segments linear, acute; sheaths whitish, narrow, extending the full length of the petiole; fertile rays 6 to 8, ¾ to 2 inches long; involucels none; flowers apparently white; pedicels spreading, 3 to 4 lines long; fruit nearly elliptical, slightly broader above, 4 to 4½ lines long, the wings slightly narrower than the body; dorsal and intermediate ribs filiform; oil-tubes very obscure, 1 or 2 (or perhaps more) in the intervals.

Foothills, 1500 to 2500 feet: Mariposa Co. Apr., fr. May.

Locs.—West Water Ditch, *Congdon;* Mariposa, *Congdon.*

Refs.—Lomatium congdonii C. & R. Contrib. U. S. Nat. Herb. 7:232 (1900), type loc. West Water Ditch, Mariposa Co., *Congdon* 114; Jepson, Man. 724 (1925). *Cogswellia congdonii* Jones, Contrib. W. Bot. 12:34 (1908).

18. **L. parryi** Jepson. Utah Parsnip. Plants 6 to 10 inches high, the peduncles erect, arising from a root-crown densely clothed with the fibrous sheaths of old leaves; herbage glabrous, the foliage eventually grayish; leaves pinnate, linear-lanceolate in outline, 6 to 8 inches long, the pinnae distant, 4 to 8 lines long, pinnately divided into linear cuspidate segments 1½ to 3 lines long; fruiting rays 1 to 1½ inches long, nearly equal; pedicels slender, 3 to 6 lines long; bractlets several, conspicuous, linear, acute, entire or cleft at apex, mostly surpassing the flowers; stylopodium more or less evident in fruit; fruit oblong, 6 lines long; dorsal and intermediate wings sharp, the lateral wings about as broad as the body; oil-tubes 1 or 2 in the dorsal intervals, 2 or 3 in the laterals, 4 to 7 on the commissure.

Clefts of rocks, 5000 to 8000 feet: eastern Mohave Desert and Death Valley region. East to Utah. May, fr. May-June.

Locs.—Providence Mts., *T. Brandegee;* Telescope Peak, Panamint Range, *Jepson* 7016. Nev.: Charleston Mts., *Purpus* 6086.

Refs.—Lomatium parryi Jepson, Madroño 1:157 (1924), Man. 724 (1925). *Peucedanum parryi* Wats. Proc. Am. Acad. 11:143 (1876), type loc. Valley of the Virgin, Washington Co., Utah, *Parry* 85. *Cogswellia parryi* Jones, Contrib. W. Bot. 12:32 (1908). *Cynomarathrum parryi* C. & R. Contrib. U. S. Nat. Herb. 7:246 (1900). *Peucedanum scopulorum* Jones, l.c. 8:31 (1898), type loc. Pleasant Cañon, Panamint Range, *Jones.*

19. **L. marginatum** C. & R. Butte Parsnip. Plants 12 to 20 inches high, the peduncles slender, erect, borne on very short stems (1 inch long) arising from the root-crown; herbage glabrous or the rays sometimes puberulent; leaves large (6 to 14 inches long), 2 to 3 times ternate, then pinnately divided into narrowly linear to filiform segments ½ to 2½ inches long; flowers whitish or yellowish; fruiting rays few, slender, 1½ to 3½ inches long; pedicels slender, 2 to 5 lines long; bractlets 1 or few, narrowly linear, elongated, acuminate, or sometimes none; fruit (immature) elliptic-oblong, glabrous, 3½ to 4½ lines long, the wings as broad as the body; oil-tubes obscure and very minute, 3 in the intervals, or several and forming an almost continuous chain (in cross-section), or none; dorsal ribs fine or obscure.

Rocky slopes or sandy flats, 1000 to 1500 feet: Tehama and Shasta Cos.; Sierra Nevada foothills from Butte Co. to Fresno Co. Apr., fr. May-June.

Field note.—The petioles are mainly subterranean, straw-white, very wide, and serve, as is often the case, to protect the embryonic shoots. The relationships of this species are mainly with L. caruifolium C. & R. Typically the herbage of L. caruifolium is minutely pubescent, while that of L. marginatum is glabrous (except sometimes the rays). There are, however, specimens of L. caruifolium with glabrous or glabrate herbage: San Luis Obispo Co., *Unangst;* Crystal Lake, San Mateo Co., *C. F. Baker* 426.

Locs.—Tehama and Shasta Cos.: Paskenta, sw. Tehama Co., *Jepson* 16,331; Crane Creek, Tehama Co., *Jepson* 14,286; Red Bluff, *Jepson* 14,284; Anderson, *Blankinship;* Olinda, Shasta Co., *Blankinship.* Sierra Nevada foothills: New York Ravine, Eldorado Co., *K. Brandegee;* Salmon Falls, Eldorado Co., *Jepson* 15,757; American River (Contrib. U. S. Nat. Herb. 7:223); Gwin Mine, Calaveras Co., *Jepson* 1816; Rattlesnake Gulch, e. of Friant, Fresno Co., *Jepson* 15,134.

Var. **purpureum** Jepson comb. n. Flowers purple.—Napa Range: Conn Valley; Chiles Creek hills, *Jepson* 6266; Chiles Valley, *Jepson* 10,417.

Refs.—Lomatium marginatum C. & R. Contrib. U. S. Nat. Herb. 7:223 (1900); Jepson, Man. 724 (1925). *Peucedanum marginatum* Benth. Pl. Hartw. 312 (1849), type loc. east side of the Sacramento Valley (probably Butte Co.), *Hartweg* 260 . *Cogswellia marginata* Jones, Contrib. W. Bot. 12:35 (1908). Var. purpureum Jepson. *L. alatum* var. *purpureum* Jepson, Madroño 1:158 (1924), type loc. Conn Valley, Napa Range, *Jepson* 14,320; Man. 724 (1925).

Lomatium alatum C. & R. Contrib. U. S. Nat. Herb. 7:228 (1900); Jepson, Man. 724 (1925). *Peucedanum triternatum* var. *alatum* C. & R. Rev. N. Am. Umbell. 70 (1888), type loc. Folsom, ne. Sacramento Co., *Curran;* bractlets none; oil-tubes said to be solitary.

20. **L. triternatum** C. & R. Buck Parsnip. Plants 1½ to 2¾ feet high; herbage minutely puberulent; peduncles arising from the root-crown or borne on stems 3 or 4 inches long, the parts at base sheathed by scale-like petioles; leaves twice or thrice ternate, then pinnate, the leaflets distant, narrowly linear, acute or long-acuminate, 1 to 5 inches long, ½ to 1¼ (or 3) lines wide; flowers bright yellow; fruiting rays very unequal, 1 to 3½ inches long; bractlets setaceous; fruiting pedicels ½ to 2½ lines long; fruit oblong to linear, glabrous, 5 to 5½ lines long; dorsal and intermediate ribs prominent, the wings half the breadth of the body; oil-tubes large, broad, 1 in each interval, 2 on the commissure.

Valleys and foothills, 500 to 4600 feet: northern Humboldt Co. to Siskiyou Co.; Nevada Co. to Modoc Co. North to British Columbia, east to Wyoming. May-June, fr. June-July.

Field note.—The roots are gathered and dried for food by the Indians; they contain much starch and have a mild sweet taste (Pac. R. Rep. 2:121).

Locs.—North Coast Ranges: Hupa, *Chandler* 1378; Burnt Ranch, Trinity Co., *Tracy* 6389; Hayfork Mt., Trinity Co., *Tracy* 6439; Klamath hills, Siskiyou Co., *Butler* 1380; Hornbrook, *K. Brandegee.* Northern Sierra Nevada: Cisco, Placer Co. (Contrib. U. S. Nat. Herb. 7:227); Dixie Valley, Lassen Co., *Baker & Nutting;* Willow Creek, Modoc Co., *R. M. Austin.*

Refs.—Lomatium triternatum C. & R. Contrib. U. S. Nat. Herb. 7:227 (1900); Jepson, Man. 724 (1925). *Seseli triternatum* Pursh, Fl. 197 (1814), type loc. Columbia River, *Lewis,* really on Clearwater River, near mouth of Potlatch River, Ida. (Contrib. U. S. Nat. Herb. 11:424). *Peucedanum triternatum* Nutt.; T. & G. Fl. 1:626 (1840). *Cogswellia triternata* Jones, Contrib. W. Bot. 12:32 (1908).

Lomatium giganteum C. & R. Contrib. U. S. Nat. Herb. 7:240 (1900), type collected by *Vasey* in Cal., "probably" Mendocino Co. acc. to Coulter and Rose, who also cite *Bolander* 6521 (by error "5521", which number does not exist in the Bolander Field Book), Elk Ridge, nw. Mendocino Co.; Jepson, Man. 725 (1925). *Cogswellia gigantea* Jones, Contrib. W. Bot. 12:32 (1908). *Lomatium nudicaule* var. *puberulum* Jepson, Madroño 1:159 (1923), type loc. Elk Ridge, nw. Mendocino Co., *Bolander* 6521. *Peucedanum nudicaule* var. *puberulum* Gray in herb. Apparently Lomatium giganteum has not been re-collected since early days. Possibly it is an outlying representative of some northern species (Oregon or Washington), such as Lomatium triternatum C. & R., Trinity County material of which, such as Hayfork Mt., *Tracy* 6439, resembles *Bolander* 6521 rather closely. We have not seen the *Vasey* type, but the type of *Peucedanum nudicaule* var. *puberulum* Gray, that is *Bolander* 6521, is the collection cited by Coulter & Rose under Lomatium giganteum. The following notes are based on *Bolander* 6521 with quoted additions from the original character: Stems 14 to 17 inches high; herbage minutely puberulent; leaves in a basal tuft, 5 to 7 inches long, ternate, the divisions of the petiole elongated, pinnately 3 to 5-foliolate at the middle or above; leaflets linear to oblanceolate, 1 to 1¾ (or "3⅓") inches long; peduncles scapose, naked save one reduced leaf above the middle, not enlarged at summit; rays 5 or 6, very unequal, ½ to 1½ (or "4⅙") inches long; bracts none; bractlets subulate; ovary glabrous or "pubescent"; "fruit linear-oblong, glabrous or nearly so, 9 lines long, the wings much narrower than the body."

21. **L. nudicaule** C. & R. Pestle Parsnip. Plants 8 to 20 inches high, glabrous; leaves 3¼ to 5¾ inches long, once or twice ternate, then pinnate with 5 to 9 leaflets; leaflets broadly ovate to lanceolate, entire or few-toothed at apex, ¾ to 2¼ inches long; peduncles stoutish, arising from the base, conspicuously enlarged at summit (pestle-like) and bearing 6 to 18 very unequal rays, the outer sometimes 2 to 4 times the length of the inner; rays in fruit dilated at apex, 1 to 6½ inches long; fruiting pedicels 1 to 3 lines long; bracts and bractlets none; flowers yellow; fruit linear to oblong, sometimes elliptic, 5 to 7 lines long, 1 to 2 (or 3) lines wide, the wings ½ the breadth of the body; oil-tubes broad, solitary in the dorsal intervals, 1 or 2 in the laterals, 4 to 6 on the commissure.

Open foothills or rolling plains, 130 to 7000 feet: Mt. Pinos region; Coast Ranges from Santa Clara Co. to Siskiyou Co.; Sierra Nevada from Sierra Co. to Modoc Co. North to British Columbia. Apr.-May, fr. June.

Locs.—Mt. Pinos region: Ft. Tejon, *Hall* 6294; Frazier Mt., *Hall* 6612. Middle and inner Coast Ranges and their bordering rolling plains: Mt. Hamilton, *Jepson* 4210; Mt. Diablo, *Jepson* 14,314; Sonoma Valley, *Jepson* 4771; Napa, *Jepson* 14,316; Conn Valley, Napa Range, *Jepson* 14,331; Cannon sta., Solano Co., *Jepson* 14,315; Burnt Ranch, Trinity Co., *Tracy* 6421; Yreka, *Butler* 1363. Sierra Nevada: Sierra Valley, Sierra Co., *Jepson* 8045; Genesee Valley, *Hall & Babcock* 4441; Jess Valley, Modoc Co., *L. S. Smith;* Goose Lake Valley, *Austin & Bruce* 2287.

Refs.—Lomatium nudicaule C. & R. Contrib. U. S. Nat. Herb. 7:238 (1900); Jepson, Man. 725, fig. 708 (1925). *Smyrnium nudicaule* Pursh, Fl. 196 (1814), type loc. Dalles, Columbia River, *Lewis*. *Peucedanum nudicaule* Nutt.; T. & G. Fl. 1:627 (1840); Jepson, Fl. W. Mid. Cal. ed. 2, 301 (1911). *Cogswellia nudicaulis* Jones, Contrib. W. Bot. 12:31 (1908). *Peucedanum robustum* Jepson, Erythea 1:9 (1893), type loc. Cannon sta., Solano Co., *Jepson* 14,315. *P. leiocarpum* Jepson, Fl. W. Mid. Cal. 357 (1901).

22. **L. ambiguum** C. & R. var. **leptocarpum** Jepson. Oregon Biscuit. Plants glabrous, 1 to 1½ feet high; peduncles ascending from the root-crown of the taproot which is tuberous below; leaves once or twice ternate, then pinnate, the ultimate segments linear, 5 to 10 lines long; rays few, very unequal, 1 line to 3 inches long; bractlets small, linear; flowers yellow; rays erect in fruit, thus forming a narrow or strict umbel; fruits nearly sessile, forming dense umbellets, linear or somewhat lanceolate, 4 to 4½ lines long, the wings very narrow (¼ to ⅓ as wide as the body); oil-tubes solitary in the intervals.

Hillsides and flats, 3500 to 5500 feet: Lassen and Modoc Cos. North to Oregon and Idaho, east to Colorado. May, fr. June-July.

Locs.—Big Valley, near Bieber, Lassen Co., *Baker & Nutting;* Jess Valley, Modoc Co., *L. S. Smith*.

Refs.—Lomatium ambiguum C. & R. Contrib. U. S. Nat. Herb. 7:212 (1900). *Eulophus ambiguus* Nutt. Jour. Acad. Phila. 7:27 (1834), type loc. Flathead River, w. Mont., *Wyeth*. Var. leptocarpum Jepson, Madroño 1:159 (1924), Man. 725 (1925). *Peucedanum leptocarpum* Nutt.; T. & G. Fl. 1:626 (1840), type loc. Columbia River plain near the Willamette River, *Nuttall*. *Lomatium leptocarpum* C. & R. Contrib. U. S. Nat. Herb. 7:213 (1900). *Cogswellia leptocarpa* Jones, Contrib. W. Bot. 12:33 (1908). *Peucedanum triternatum* var. *leptocarpum* T. & G. l.c. *P. ambiguum* var. *leptocarpum* C. & R. Rev. N. Am. Umbell. 59 (1888).

23. **L. piperi** C. & R. Indian Biscuit. Plants 1⅓ to 5 inches high, the slender peduncles divaricate, borne on very short erect subterranean stems which rise from globose tubers 4 to 7 lines in diameter; herbage glabrous; leaves basal, biternately divided into linear-lanceolate segments 4 to 12 lines long; umbels small, 2 to 4-rayed; flowers white; bractlets narrow-lanceolate; fruiting rays 3 to 10 lines long; fruiting pedicels ¼ to 1 line long; fruit elliptic, 2 to 3 lines long, the wings ½ as broad as the body; oil-tubes minute, 2 or 3 in the intervals, 4 on the commissure.

Hillsides, 2600 to 4900 feet: Sierra Co. to Siskiyou Co. North to Washington. Feb., fr. May.

Locs.—Sierra Valley, *Lemmon;* Long Mdws., Devils Garden, Modoc Co., *L. S. Smith* 1196; Edgewood, Siskiyou Co., *Kisling;* Yreka, *Butler* 578, 1130.

Refs.—LOMATIUM PIPERI C. & R. Contrib. U. S. Nat. Herb. 7:211 (1900), type loc. Ellensburg, Kittitas Co., Wash., *Vasey;* Jepson, Man. 725 (1925). *Cogswellia piperi* Jones, Contrib. W. Bot. 12:33 (1908).

25. PASTINACA L.

Tall branching biennial with angular or fluted leafy stems from thick roots. Leaves large, simply pinnate. Flowers yellow, in compound umbels. Involucre and involucels small or commonly none. Fruit oval, strongly compressed. Lateral ribs winged; dorsal and intermediate ribs filiform. Oil-tubes not quite as long as fruit, solitary in the intervals, 2 to 4 on the commissure.—Species about 14, Europe, Asia and Africa. (Latin name of the Parsnip, including also the Carrot, according to Pliny.)

1. **P. sativa** L. COMMON PARSNIP. Erect, 3 to 4 feet high; leaflets ovate, serrate or somewhat incised, lobed or even more or less 3 to 5-divided, 3 to 4 inches long; rays 10 to 20, 1 to 2½ inches long; fruit 2½ to 3 lines long; oil-tubes conspicuous.

European garden plant, escaped from cultivation and locally naturalized in moist valleys. May-June.

Locs.—San Gorgonio Creek, San Bernardino Mts., *Parish* 1589; San Bernardino, *Parish* in 1888; Coldwater Cañon, San Gabriel Mts., *Ewan* 7816; Cienega near Los Angeles (Erythea 1:59); Boulder Creek, Santa Cruz Mts., *H. A. Walker* 834; Scott Valley, Lake Co., *Jepson* 14,223; Comptche, Mendocino Co., *H. A. Walker* 338; Sacramento, *Bioletti.*

Refs.—PASTINACA SATIVA L. Sp. Pl. 262 (1753), type European; Jepson Fl. W. Mid. Cal. 360 (1901), ed. 2, 303 (1911), Man. 726, fig. 709 (1925).

26. ANETHUM L.

Slender annuals with leafy stems and finely dissected leaves. Flowers yellow, in compound umbels. Involucre and involucels none. Fruit elliptical, flattened dorsally, the lateral ribs narrowly winged. Oil-tubes solitary in the intervals.—Species 2, Asia. (Ancient Greek name of the Dill.)

1. **A. graveolens** L. DILL. Plants usually branching, 1 to 3 feet high.

Cultivated plant of the Old World, occasionally escaped from gardens about towns, 5 to 1500 feet.

Locs.—San Bernardino (Zoe 2:28); Los Angeles (Erythea 1:59); Oakland (Proc. Iowa Acad. Sci. 23:491).

Refs.—ANETHUM GRAVEOLENS L. Sp. Pl. 263 (1753), type Iberian; Jepson, Man. 726 (1925). *Peucedanum graveolens* C. & R. Contrib. U. S. Nat. Herb. 7:255 (1900), not published by Bentham and Hooker as there cited.

27. OXYPOLIS Raf.

Glabrous erect aquatic herbs with fascicled tubers borne on a short rootstock. Leaves ternate or (in ours) pinnate. Umbels compound. Involucre and involucels present. Flowers white. Calyx-teeth evident. Fruit flattened dorsally, ovate to obovate; dorsal and intermediate ribs filiform; lateral ribs broadly winged, the wings closely contiguous to those of the companion carpel and strongly nerved next to the body (thus giving the appearance of 5 dorsal ribs). Stylopodium short-conical. Oil-tubes solitary in the intervals, 2 to 6 on the commissure.—Species 5, North America. (Greek oxys, sharp, and polis, city, application uncertain, possibly referring to the many acute leaflets.)

1. **O. occidentalis** C. & R. Plants 2 to 3¾ feet high; stem simple or little branched; fascicled roots fusiform-fleshy; leaves simply pinnate, long-petioled, the lower 1 to 2¼ feet long; leaflets 5 to 13, orbicular or broadly ovate to linear-acuminate, serrate, entire at base, ¾ to 3¼ inches long; fruiting rays 1 to 3 inches long; fruit elliptic-obovate, 2½ to 3 lines long.

Marshy meadows or in shallow water, 4700 to 8500 feet: Sierra Nevada from Tulare Co. to Eldorado Co. North to Crater Lake, Oregon. July-Aug., fr. Aug.

Locs.—Volcano Creek, *Hall & Babcock* 5443; Giant Forest, *Jepson* 13,305; Bubbs Creek, Fresno Co., *Jepson* 803; Markwood Mdw., Fresno Co., *Jepson* 16,042; Shaver Lake, Fresno Co., *Jepson* 16,094; Huntington Lake, *Jepson* 13,075; Kelty Mdw., Madera Co., acc. *Kennedy;* Fresno Big Trees, *Jepson* 15,980; Konitz place, Mariposa Co., *Congdon;* Chilnualna Creek, Mariposa Co., *Congdon;* Peregoy Mdw., Yosemite, *Jepson* 5640; Strawberry, Tuolumne Co., *A. L. Grant* 561; Dorrington, Calaveras Co., *Jepson* 10,191; Silver Creek, Eldorado Co., *Kennedy* 90.

Refs.—OXYPOLIS OCCIDENTALIS C. & R. Contrib. U. S. Nat. Herb. 7:196 (1900), type loc. Crater Lake, *Leiberg* 4413; Hall, Univ. Cal. Publ. Bot. 6:168 (1915); Jepson, Man. 726, fig. 710 (1925).

28. **CONIOSELINUM** Fisch.

Tall branching perennials with leafy stems, glabrous herbage and ternately decompound leaves. Flowers white, in compound umbels. Involucre of few bracts. Involucels of many bractlets. Fruit oblong to obovate, flattened dorsally, with rather prominent stylopodium. Ribs narrowly winged, the lateral usually broadest. Oil-tubes solitary in the intervals, or sometimes 2 in the lateral one, 2 to 4 on the commissure.—Species 5, North America, Europe and Asia. (Compounded from Conium and Selinum, since resembling both these genera.)

1. **C. gmelinii** C. & R. LOST PARSLEY. Stems stout, 3 to 5 feet high; leaves ternate, then pinnate, the 5 or 7 divisions or leaflets ovate in outline, acute, deeply pinnatifid and more or less toothed, ½ to 1¼ inches long; umbels on stout peduncles; rays 15 to 26, 1 to 1½ inches long in fruit; bracts 2 to 4; involucels of several narrowly linear bractlets; fruiting pedicels slender, 3 to 4 lines long; fruit oblong, 3 lines long; wings thickish and corky, rather narrow; oil-tubes conspicuous, 2 on the commissure, solitary in the intervals, sunk in the body of the seed, especially the dorsal ones.

Marshy flats, 5 to 1500 feet: Mendocino Co. to Humboldt Co. North along the coast to Washington and Alaska. Fr. Aug.

Locs.—Conioselinum gmelinii is very slightly known in California, where only three stations can be cited: Long Valley, Mendocino Co. (Contrib. U. S. Nat. Herb. 7:152); Indianola, s. Humboldt Bay, *Tracy* 4388; Crescent City, *Jepson* 9389. Alaska: Uyak, Kadiak Isl., *Jepson* 382.

Refs.—CONIOSELINUM GMELINII C. & R. Contrib. U. S. Nat. Herb. 7:150, fig. 48 (1900). *Ligusticum gmelinii* C. & S. Linnaea 1:391 (1826), type loc. Unalaska, *Chamisso. C. pacificum* C. & R. Contrib. U. S. Nat. Herb. 7:152 (1900); Jepson, Man. 727 (1925). *Selinum pacificum* Wats. Proc. Am. Acad. 11:140 (1876), type *Kellogg & Harford* 315, probably collected in Mendocino Co., but said to have been "Sausalito hills"; Jepson, Fl. W. Mid. Cal. 355 (1901), ed. 2, 299 (1911).

29. **ANGELICA** L.

Stout perennials with leafy stems and ternately or pinnately compound leaves. Flowers white, in large terminal compound umbels. Involucre none or scanty. Involucels of few small bractlets or none. Calyx-teeth mostly obsolete. Fruit strongly compressed, elliptic-oblong in outline. Ribs prominent, the lateral broadly winged, the others often narrowly winged. Oil-tubes 1 to 3 in the intervals, 2 to 4 on the commissure.—Species about 50, North America, Europe, Asia and New Zealand. (Latin angelica, angelic, on account of its medicinal properties.)

Maritime species; rays subequal; herbage more or less tomentose; ovary tomentose........................1. *A. hendersonii.*
Montane species; rays more or less unequal.
  Herbage puberulent or eventually glabrous; ovary tomentulose; Coast Ranges and coastal S. Cal........................2. *A. tomentosa.*
  Herbage glabrous.
    Leaflets not linear.
      Ovary pubescent; leaflets narrow-lanceolate to ovate-lanceolate; central and n. Sierra Nevada........................3. *A. breweri.*
      Ovary glabrous; leaflets ovate-lanceolate; Siskiyou Co........................4. *A. lyallii.*
    Leaflets narrowly linear; s. Sierra Nevada........................5. *A. lineariloba.*

1. **A. hendersonii** C. & R. Coast Angelica. Very stout, ½ to 3 feet high; herbage more or less tomentose, especially on the inflorescence and under surface of the leaves; leaves quinate or ternate, then pinnate; leaflets tending to be crowded, thick, broadly ovate, 1½ to 2½ inches long, obtuse (or rarely acute), serrate; umbels rather condensed; rays in flower subequal; fruiting rays ¾ to 2¼ inches long; umbellets dense, as if capitate; pedicels 1 line long or less; bractlets 1 or 2, linear-acuminate; fruit broadly oblong, slightly pubescent, 3 to 4 lines long; lateral wings thick and corky, as broad as the body; oil-tubes solitary in the intervals; seed deeply sulcate beneath the oil-tubes.

Sea-bluffs or flats along the coast, 5 to 300 feet: San Francisco Co. to Del Norte Co. North to Washington. July-Aug.

Phylogenetic note.—The leaves are a little fleshy and rigid; the pinnae stand at right angles to the rachis, the leaflets at right angles to the secondary rachis. The plants are somewhat squat or dwarfish and the leaves are condensed as is the inflorescence. In all these particulars Angelica hendersonii seems as if it were, phylogenetically, a littoral adaptation of the inland A. tomentosa Wats.

Locs.—Pt. Lobos, San Francisco (Fl. W. Mid. Cal. 356); Pt. Reyes, *Davy* 6869; Salmon Creek, Sonoma coast, *Jepson* 15,940; Newport, Mendocino Co., *Jepson* 13,487; Loleta, Humboldt Co., *Jepson* 2133; Crescent City, *H. Parks* 3393.

Refs.—Angelica hendersonii C. & R. Bot. Gaz. 13:80 (1888), type loc. Long Beach, Ilwaco, Wash., *Henderson* 2158; Jepson, Fl. W. Mid. Cal. 355 (1901), ed. 2, 299 (1911), Man. 727, fig. 711 (1925).

2. **A. tomentosa** Wats. Wood Angelica. Stout, 2 to 8 feet high, the stems and especially the leaves puberulent, or sometimes nearly glabrous; leaves bipinnate or ternate or quinate and then pinnate; leaflets ovate, acute, acutish or often long-pointed, sometimes varying to lanceolate or roundish, irregularly serrate, obliquely 2-lobed, or not lobed and merely oblique, 1½ to 3 (or 6) inches long; petioles strongly dilated at base; fruiting rays 1 to 5 inches long; fruiting pedicels 2 to 3 lines long; ovary tomentulose; fruit oblong or elliptic, glabrous, 3 to 4½ lines long; dorsal and intermediate ribs small and acutish; lateral wings nearly equaling the body in breadth; oil-tubes 1 in the intervals, or sometimes 2 in the lateral intervals, mostly 2 on the commissure; seed somewhat sulcate beneath the oil-tubes.

Shady woods, 200 to 7000 feet: coastal Southern California; Coast Ranges from Santa Cruz Co. to Humboldt Co. June-July.

Locs.—Coastal S. Cal.: Palomar Mt., *McClatchie;* Mt. San Jacinto (Univ. Cal. Publ. Bot. 1:98); Waterman Cañon, San Bernardino Mts., *Parish;* West Fork Cucamonga Cañon, San Gabriel Mts.; Cow Cañon, San Gabriel River, *Peirson* 2508; Big Pine Mt., Santa Barbara Co., *J. R. Hall.* Coast Ranges: Santa Cruz Mts. (Anderson, Nat. Hist. Santa Cruz Co. 38); Crystal Springs Lake, San Mateo Co., *C. F. Baker* 3354; Berkeley, *H. A. Walker;* Mt. Tamalpais, *Jepson;* St. Helena, *Jepson* 13,483; Calistoga, *Jepson* 13,484; Peanut, Trinity Co., *J. W. Patton;* Eureka, *Tracy* 6902; Alton, Humboldt Co., *Tracy* 6560.

Var. **californica** Jepson. Rays very unequal (1¼ to 5¾ inches long), scaberulous at the ends; oil-tubes 2 (or 3) in the intervals, mostly 4 in lateral pairs on the commissure.—Vaca Mts.

Refs.—Angelica tomentosa Wats. Proc. Am. Acad. 11:141 (1876), type loc. San Francisco; Jepson, Fl. W. Mid. Cal. 356 (1901), ed. 2, 300 (1911), Man. 728 (1925). *A. tomentosa* var. *elata* Jepson, Fl. W. Mid. Cal. 356 (1901), ed. 2, 300 (1911), type loc. Napa Valley, *Jepson.* Var. californica Jepson, Fl. W. Mid. Cal. 356 (1901), ed. 2, 300 (1911), Man. 728 (1925). *A. californica* Jepson, Erythea 1:8 (1893), type loc. Gates Cañon, Vaca Mts., *Jepson* 14,246, 14,250.

3. **A. breweri** Gray. Sierra Angelica. (Fig. 270.) Stems 3 to 5 feet high; herbage glabrous; leaves ternate or quinate, then pinnate; leaflets lanceolate to oblong or occasionally ovate-lanceolate, acuminate, sharply serrate, 1½ to 4 inches long; rays many, 1½ to 2½ inches long in fruit; pedicels 2 to 3½ lines long; rays and pedicels not "web-footed" or very obscurely so; pedicels and ovaries whitish-puberulent; fruit oblong or somewhat narrowed below, pubescent or becoming glabrous, 3 to 4½ lines long; dorsal and intermediate ribs more or less prominent; lateral wings as wide as the body; oil-tubes 1 or 2 in the intervals.

Openly wooded mountain slopes, 4500 to 8000 feet: Sierra Nevada from Inyo Co. to Tehama Co. Also in western Nevada. July-Aug.

Locs.—Burdick grade, Inyo Co., *Almeda Nordyke;* Bubbs Creek, Fresno Co. (Sierra Club Publ. 27:49); Chilnualna Falls, Mariposa Co., *Congdon;* Hetch-Hetchy, *Jepson* 3451; Dorrington, Calaveras Co., *A. L. Grant* 591; Kennedy Mdw., Tuolumne Co., *A. L. Grant* 445; Barrette Camp, Silver Creek, Eldorado Co., *Kennedy* 79; Bear Valley, Nevada Co., *Jepson* 13,486; Bowman Lake, Nevada Co., *A. M. Carpenter;* Pioneer road sta., North Fork Yuba River, Sierra Co., *Jepson* 16,832; Rich Point, Middle Fork Feather River, *Jepson* 10,610; Manzanita Lake, e. Tehama Co., *Jepson* 15,330.

Refs.—Angelica breweri Gray, Proc. Am. Acad. 7:348 (1868), type loc. Ebbetts Pass, Alpine Co., *Brewer;* Jepson, Man. 728 (1925).

4. **A. lyallii** Wats. Cascade Angelica. Plants 2 to 4 feet high; herbage and inflorescence glabrous; leaves biternate, then pinnate; leaflets ovate-lanceolate, serrate, 1½ to 3½ or 5 inches long; fruiting rays 1½ to 2½ inches long, the outer row somewhat coalescent at base so as to be web-footed; outer row of pedicels similarly coalescent; fruit broadly oblong to obovate, 3 to 3½ lines long; dorsal and intermediate ribs sharply salient, equal; lateral wings about as broad as the body; oil-tubes solitary in the intervals.

Boggy or moist mountain slopes, 5500 to 7000 feet: Siskiyou Co. North to Alberta. July.

Locs.—Mt. Shasta, *K. Brandegee;* Log Lake, Shackelford Creek, *Butler* 465.

Refs.—Angelica lyallii Wats. Proc. Am. Acad. 17:374 (1882), type loc. "Galton and Cascade Mountains", n. Wash., *Lyall;* Jepson, Man. 728 (1925).

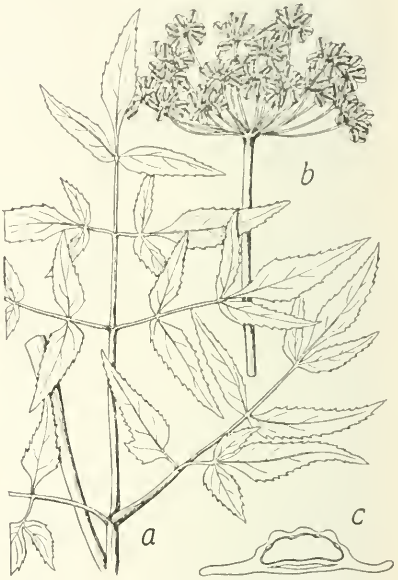


Fig. 270. Angelica breweri Gray. *a*, leaf, × ⅓; *b*, umbel, × ⅓; *c*, cross sect. of carpel, × 6.

5. **A. lineariloba** Gray. Poison Angelica. Stout, glabrous, 2 to 3 feet high; leaves 2 or 3 times ternate, then pinnate with about 5 (3 to 9) leaflets; leaflets linear or linear-lanceolate, 1 to 3 (or 5) inches long, 1 to 2 (or 5) lines wide, entire or often with a pair of coarse teeth towards the base, frequently decurrent on the rachis; fruiting rays 1 to 2 or 3¾ inches long; involucre and involucels none; fruit oval-oblong, glabrous, 4 to 7 lines long; dorsal and intermediate ribs filiform; lateral wings thickish, a little narrower than the body; oil-tubes solitary in the dorsal intervals, in pairs in the laterals.

Openly brushy mountain slopes in granite sand, 6000 to 9500 feet: Tulare Co. to Mariposa and Mono Cos. July-Aug.

Locs.—Farewell Gap, *Jepson* 1140; Mineral King, *Jepson* 1155; Lewis Camp, Kern Cañon, Tulare Co., *Jepson* 968; Bubbs Creek, *Jepson* 791; Kaiser Pass, *Jepson* 16,092; San Joaquin Pass, Madera Co., *Congdon;* Lundy, Mono Co., *Congdon.* In Kern Cañon the herbage is said to kill horses.

Var. culbertsonii Jepson. Leaf-segments 4 to 4½ lines wide.—Little Kern River.

Refs.—Angelica lineariloba Gray, Proc. Am. Acad. 7:347 (1868), type loc. Ostranders Mdws., Yosemite, *Bolander;* Jepson, Man. 728 (1925). Var. culbertsonii Jepson, l.c., type loc. Little Kern River, *Culbertson* 4276.

30. COELOPLEURUM Ledeb.

Very stout perennial herb of the sea-coast with glabrous herbage. Leaves uni-, bi- or tri-ternate, with very large inflated petioles. Flowers greenish-white, in many-rayed umbels. Involucre of few narrow bracts, sometimes foliaceous. Involucel of many linear-lanceolate bractlets. Fruit elliptic-oblong, not flattened dorsally. Ribs very thick and corky, becoming hollow, equal or the lateral ones a little broader. Oil-tubes small, 1 in the intervals, 1 or 2 under each rib, 2 to 4 on the commissure.—Species about 4, North America and Asia. (Greek koilos, hollow, and pleuron, rib, referring to the cavity made by the intruded ribs.)

1. **C. maritimum** C. & R. Stems corymbosely branched, 2 to 3 feet high; leaflets roundish to ovate, crenate, 1¼ to 4 inches long; rays 1 to 1¾ inches long; fruits 2½ to 3 lines long, the lateral ribs twice as broad as the others.

Along the coast, 5 to 100 feet: central Humboldt Co. North to Washington. July.

Locs.—Loleta, *John Mathiesen;* Hookton, Humboldt Bay, *Tracy* 4581.

Refs.—COELOPLEURUM MARITIMUM C. & R. Bot. Gaz. 13:145 (1888), type loc. Long Beach, Ilwaco, Wash., *Henderson* 384; Hall, Univ. Cal. Publ. Bot. 6:167 (1915). *C. lucidum* Jepson, Man. 728 (1925), not Fer. (1919).

31. SPHENOSCIADIUM Gray

Perennials with thick roots. Stems stout, tall, nearly simple, glabrous. Leaves once or twice pinnate with bladdery dilated petioles. Flowers white (or sometimes purplish), sessile on enlarged receptacles and forming compact heads, the heads borne on tomentose rays in a medium-sized umbel. Involucre none. Involucels of many linear-setaceous bractlets. Calyx-teeth none. Fruit cuneate-obovate, flattened, subglabrous. Ribs prominent, winged above, the dorsal and intermediate ones narrow, the lateral broader. Oil-tubes solitary in the intervals, 2 on the commissure. Seed face plane.—Species 1, Pacific North America. (Greek sphenos, a wedge and sciadios, an umbrella, referring to the umbel.)

1. **S. capitellatum** Gray. RANGERS BUTTON. Stems very stout, 3 to 5 feet high; herbage zinc-grey; leaves large, glabrous, ¾ to 2 feet long; leaflets or segments linear-lanceolate to oblong or ovate, serrate or coarsely and saliently few-toothed or incised above, more or less entire below; rays 4 to 8 (or 14), subequal, 1 to 2 (or 4) inches long; flowers pubescent; involucels of a few deciduous bractlets; fruit cuneate-obovate, 3 lines long.

Swampy ground, about springs or in moist loamy soil along streams or on flats, 3000 to 8500 feet: mountains of Southern California; Tehachapi Mts.; Sierra Nevada; White Mts.; high North Coast Ranges. North to Oregon and Idaho, east to Nevada, south to Lower California. July-Aug., fr. Sept.

Locs.—San Jacinto Mts. (C. & R. Rev. N. Am. Umbell. 43); Bluff Lake, San Bernardino Mts., *Parish;* Bitter Creek, Mt. Pinos; Bisses sta., Tehachapi Mts., *Dudley;* Mt. Silliman; Bench Mdw., Kaiser Ridge, *Jepson* 13,275; Line Creek, Huntington Lake, *Jepson* 13,096; Red Mdw., near Devils Postpile, Madera Co., *A. L. Grant* 1563a; Hetch-Hetchy, *Jepson* 3484; Soda Springs Cañon, Kennedy Lake, Tuolumne Co., *A. L. Grant* 504; Poison Creek, White Mts., *Jepson* 7373; Hermit Valley, Alpine Co., *Hansen* 324; Donner Lake, *Sonne;* Yuka Pass, Sierra Co., *Jepson* 16,859; Susanville, *Pearl Safford;* Mill Creek, Warner Mts., *L. S. Smith* 998; Shasta Sprs., *Jepson* 13,482; Shackelford Creek, w. Siskiyou Co., *Butler* 460; Asa Bean Flat, ne. Mendocino Co., *Cronemiller.*

Three varieties are recognized in the Manual of the Flowering Plants of California: var. *scabrum* Jepson (leaves typically scaberulous), var. *validum* Jepson (leaf-segments ovate) and var. *eryngiifolium* Jepson (leaves glabrous or tending to be). These represent merely extremes of variation. The third, var. eryngiifolium, is fully connected by a series of intergrades with the species. The type of Selinum eryngiifolium Greene represents a dwarfed and probably much starved state, most likely growing on granite. The original, collected July 12, 1889 by Drew (really by Chesnut and Drew), is from the granite dome, Cloud's Rest, above Yosemite. The ovate-acute spinulose-tipped leaf-segments are only 1 to 1½ lines long, the segments and pinnae noticeably divaricate. Every intergrade between this state and a more usual or normal form with narrowly linear or lanceolate segments 1½ to 10 lines long is represented in the higher Sierra Nevada and on its eastern slope. As var. eryngiifolium we cite: Crescent Lake, Mariposa Co., *Congdon;*

Minarets, Madera Co., *Congdon;* Upper Funston Mdws., Kern Cañon. The Funston Mdws. form with linear leaf segments, in turn, intergrades to the usual form of the Sierra Nevada.

Refs.—SPHENOSCIADIUM CAPITELLATUM Gray, Proc. Am. Acad. 6:537 (1865), type loc. Ebbetts Pass, *Brewer;* Jepson, Man. 729, fig. 712 (1925). *Selinum capitellatum* B. & W. Bot. Cal. 1:265 (1876). *Sphenosciadium capitellatum* var. *scabrum* Jepson l.c., Alta Mdws., Tulare Co., *Hopping* 504 (type). *S. capitellatum* var. *validum* Jepson, l.c. *S. validum* Congdon, Erythea 7:185 (1900), type loc. Wawona, *Congdon. S. capitellatum* var. *eryngiifolium* Jepson l.c. *Selinum eryngiifolium* Greene, Pitt. 2:102 (1890), type loc. above Yosemite, *Drew. Sphenosciadium eryngiifolium* C. & R. Contrib. U. S. Nat. Herb. 7:128 (1900).

32. CYMOPTERUS Raf.

Perennial herbs with basal leaves. Herbage glabrous (except in no. 6). Leaves usually ternate, then once to thrice pinnate and much dissected or incised. Involucre usually lacking. Involucels always present. Flowers yellow, white or purple, in compound umbels. Calyx-teeth usually evident. Fruit oblong to orbicular, mostly dorsally flattened, the carpels 3 to 5-winged. Stylopodium wanting. Oil-tubes several in the intervals, 2 to many on the commissure. Seed flat to very slightly or not at all dorsally flattened.—Species about 35, western North America and eastern Asia. (Greek kuma, wave, and pteron, wing, the ribs in some species with undulate wings.)

Wings of carpels thin, undulate-crisped (except in the var.); tall plants; Sierra Nevada and mts. of n. Cal..........1. *C. terebinthinus.*
Wings of carpels commonly thickened or corky at insertion, sometimes corky throughout.
Erect (though reduced) plants of the deserts and desert slopes of mountain ranges.
Leaves glabrous.
Fruit wings entire.
Involucre none or a few small bracts; leaves light green.
Flowers in umbels; ultimate leaf-segments lanceolate or oblong.......... 2. *C. panamintensis.*
Flowers in dense heads; leaf-divisions ovate, pinnately incised and crenate. 3. *C. globosus.*
Involucre white, very conspicuous; flowers in dense heads or in compact umbels; leaves grayish, the ultimate divisions ovate, pinnately incised or crenate..........4. *C. purpurascens.*
Fruit wings with shredded margins; flowers in dense globose purple heads.......... 5. *C. deserticola.*
Leaf-blades scaberulous.
Fruit wings plane; umbels with rays or sometimes capitate..........6. *C. aboriginum.*
Fruit wings undulate-convolute; umbels capitate..........7. *C. cinerarius.*
Prostrate plants of sandy sea-beaches; umbellets capitate..........8. *C. littoralis.*

1. **C. terebinthinus** T. & G. Plants ½ to 1½ feet high, or high alpine states much reduced, the leaves all basal; peduncles about twice as long as the leaves, arising from the shortly branched root-crown which is clothed with persistent leaf sheaths; leaf-blades 2 to 6 inches long, on petioles about as long, usually ternate, then 1 to 3 times pinnate and pinnately dissected into short linear segments about 1 line long; umbels with unequal rays; involucre none; involucels of linear acuminate bractlets; flowers yellow; fruiting rays 1 to 3 inches long; fruiting pedicels 3 to 5 lines long; fruit broadly oblong to nearly orbicular, 4 to 6 lines long; carpels with 3 to 5 broad thin undulate crisped wings, or one carpel with broad wings (especially the lateral wings) and the companion carpel with wings narrow, crisped and much reduced; oil-tubes very small, 4 to 9 in the intervals, 8 to 16 (or 20) on the commissure.

Dry brushy or rocky slopes, 5000 to 11,000 feet: Sierra Nevada from Tulare Co. to Lassen Co. North to Washington. May-June, fr. July-Aug.

Locs.—North Fork Middle Tule River, *Jepson* 4688; Farewell Gap, *Jepson* 1013; Putnam Cañon, Tulare Co., *Walter Fry* 335; Bubbs Creek, *Jepson* 794; Huntington Lake, *A. L. Grant* 1137; Jackass Mdw., Fresno Co., *E. Ferguson* 437; Dana Fork Tuolumne River, *Jepson* 3264; Muir Gorge to Table Lake, Tuolumne River, *Jepson* 3390; Rancheria Mt., Tuolumne Co., *Jepson* 4597; Kennedy Lake, Tuolumne Co., *A. L. Grant* 248; Barrette Camp, 3 mi. s. of Tells Peak, Eldorado Co., *Kennedy* 106; Echo Lake near Fallen Leaf, *Ottley* 1185; Summit sta., Nevada Co., *Sonne;* Silver Lake, Lassen Co., *Baker & Nutting.* Increase of material has made the following variety less significant.

Var. **californicus** Jepson. Leaves with ultimate divisions ovate to almost linear; involucels of small linear bractlets; fruit oblong, 3 to 4 lines long; wings not undulate-crisped; intermediate and dorsal wings sometimes reduced in breadth; oil-tubes 3 to 5 in the intervals, 6 on the commissure.—Northern Sierra Nevada, 1500 to 5000 feet, from Nevada Co. to Lassen Co.; inner North Coast Range from Trinity Co. to Siskiyou Co., 1400 to 4000 feet.

Locs.—Sisson, *Jepson* 13,488; Forks of Salmon to Cecilville, *Jepson* 2080; Big Bar, Trinity Co., *Tracy* 7548.

Refs.—CYMOPTERUS TEREBINTHINUS T. & G. Fl. 1:624 (1840); Jepson, Man. 730, fig. 713 (1925). *Selinum terebinthinum* Hook. Fl. Bor. Am. 1:266, t. 95 (1834), type loc. Walla Walla River, *Douglas. Pteryxia terebinthina* C. & R. Contrib. U. S. Nat. Herb. 7:171 (1900). Var. CALIFORNICUS Jepson, Man. 730 (1925). *Pteryxia californica* C. & R. Contrib. U. S. Nat. Herb. 7:172 (1900), type loc. Sisson, Siskiyou Co., *H. E. Brown.*

2. **C. panamintensis** C. & R. Plants low (3 to 10 inches high); peduncles purplish, arising from a root-crown sheathed with old leaf bases; leaf-blades 2 to 2¾ inches long, on petioles about as long, ternate, then once or twice pinnate, the pinnae finely dissected; ultimate segments 1 to 1½ lines long, tipped with a slender bristle-like apiculation; rays in fruit 1 to 1½ inches long; pedicels short; involucre none; involucels small, gamophyllous, somewhat one-sided, purplish, cleft into ovate acuminate segments; flowers greenish-yellow; fruit 4½ lines long, glabrous, each carpel with 5 broad wings, the wings very thick at insertion; oil-tubes 3 or 4 in the intervals, 4 or 5 on the commissure; seed face deeply concave.

Dry rocky slopes, 3000 to 7000 feet: desert ranges of the eastern Mohave Desert and Inyo Co. Apr., fr. May-June.

Note on the fruit.—The fruit in horizontal cross section is an ellipse in outline, with the long axis of the ellipse at right angles to the plane of the commissure. The fruit is thus technically a little obcompressed. Mature carpels are produced freely, yet the species is on the whole rare in individuals.

Locs.—Kane Spr., Ord Mt., *Hall & Chandler* 6805; Pilot Knob, *Peirson;* Argus Range, *Purpus* 5288; Hanaupah Cañon, Panamint Range, *Jepson* 6991.

Var. **acutifolius** Munz. Ultimate leaf-segments linear, remote, 1½ to 5 lines long, not cuspidate or less obviously so.—Central Mohave Desert in the Mohave River Valley (Red Knob, Barstow, *Parish* 19,235; Newberry, *Hall* 6127) and north side of the Colorado Desert (Eagle Mts., *Clary* 653).

Refs.—CYMOPTERUS PANAMINTENSIS C. & R. Contrib. U. S. Nat. Herb. 4:116 (1893), type loc. Johnson Cañon, Panamint Range, *Coville* 508; Jepson, Man. 730 (1925). *Aulospermum panamintense* C. & R. Contrib. U. S. Nat. Herb. 7:177 (1900). Var. ACUTIFOLIUS Munz, Man. S. Cal. Bot. 357 (1935). *Aulospermum panamintense* var. *acutifolium* C. & R. l.c., type loc. Newberry Spr., central Mohave Desert, *Lemmon.*

3. **C. globosus** Wats. Plants 1½ to 2½ inches high, the leaves basal or subbasal and the peduncles scape-like or nearly so; herbage glabrous; peduncles about equaling the leaves; leaf-blades ovate in outline, ¾ to 1½ inches long, pinnate, the ovate segments pinnatifid and then incised or toothed; petioles ¾ to 2 inches long; umbels reduced to dense globose heads 10 to 13 lines wide in fruit; sepals purplish, narrowly lanceolate, over ½ as long as the petals; petals whitish, broadly lanceolate, acuminate at tip; wings on the ovary produced upward beyond the body and acute; fruits 3½ to 4½ lines long; wings white, ½ to 1 line wide, a little auricled at base, conspicuously corky-thickened from the margin to the body of the fruit, so that the outline in cross section is ovate, with the apex obtuse; oil-tubes solitary in the intervals, 2 on the commissure.

Dry flats and hills, 4500 to 6500 feet: Mono Co. East to Utah. Apr.-May, fr. June.

Locs.—Benton, se. Mono Co. (Ann. Mo. Bot. Gard. 17:382). Nev.: Trail Cañon, Esmeralda Co., *Duran* 2740.

Refs.—CYMOPTERUS GLOBOSUS Wats. Proc. Am. Acad. 11:141 (1876). *C. montanus* var. *globosus* Wats. Bot. King 124 (1871), type loc. Carson Valley, Nev., *Watson* 449.

4. **C. purpurascens** Jones. Plants 2 to 5 inches high, the leaves and peduncles basal or sub-basal; herbage glabrous; peduncles equaling or shorter than the leaves; leaves gray-pallid, the blades ternate, then bipinnatifid, ¾ to 2 inches long; ultimate segments ovate in outline, 4 to 6 lines long, pinnately crenate or incised; umbels capitate or more or less compacted; involucres conspicuous, white, their broad bracts united below and with 3 or 4 prominent green or purplish nerves; involucels resembling the involucres but smaller; flowers purple; fruit orbicular, 4 to 6 lines long, its body oblong; carpels flattened with 5 broad thin wings (corky-thickened next the body of the carpel); oil-tubes 2 or 3 (or 4) in the intervals, 4 to 7 on the commissure.

Rocky hills, 4800 to 9000 feet: eastern Mohave Desert. East to Utah and New Mexico. Mar.-Apr., fr. May-June.

Locs.—Barnwell, New York Mts., *H. A. Longenecker.* Nev.: Candelaria, Mineral Co., *Shockley* 208; Pioche, Lincoln Co., *Maud Minthorn;* Mt. Gabb, Palmetto Range, *Purpus* 5866.

Refs.—CYMOPTERUS PURPURASCENS Jones, Zoe 4:277 (1893). *C. montanus* T. & G. var. *purpurascens* Gray, Bot. Ives 15 (1860), type loc. Oraibi, Navajo Co., Ariz., *Newberry. C. utahensis* Jones, Proc. Cal. Acad. ser. 2, 5:684 (1895), type loc. Pagumpa, Ariz., *Jones* 5098; Jepson, Man. 730 (1925). *Phellopterus purpurascens* C. & R. Contrib. U. S. Nat. Herb. 7:168 (1900).

5. **C. deserticola** Bdg. Plants 4 to 6 inches high, the leaves all basal and the scape-like peduncles arising from the root-crown; peduncles ascending, a little exceeding the leaves; leaves glabrous, the blades triangular in outline, 2 inches long, bi- or tri-ternate, then pinnately parted, 1¼ to 2¼ inches long; segments with acute bristle-tipped lobes; petioles 2½ to 3½ inches long; involucre with short linear bracts; flowers dark purple, crowded in a globose head ½ to ¾ inches in diameter; fruits 2 lines long, sessile; lateral wings thick, corky, narrow, pubescent, with the margins shredded; oil-tubes minute and numerous, forming in cross-section a continuous chain.

Sandy plains, 2600 to 3100 feet: central Mohave Desert. Apr., fr. June.

Geog. note.—Cymopterus deserticola is an endemic of the Mohave Desert which thus far has been collected perhaps only four times and is known only from Kramer and from the neighborhood of Victorville.

Refs.—CYMOPTERUS DESERTICOLA Bdg. Univ. Cal. Publ. Bot. 6:168 (1915), type loc. Kramer, Mohave Desert, *K. Brandegee;* Jepson, Man. 731 (1925); Mathias, Ann. Mo. Bot. Gard. 17:379 (1930).

6. **C. aboriginum** Jones. Plants 4 to 11 inches high, the leaves all basal and the scape-like peduncles arising from the root-crown; petioles and peduncles glabrous or nearly so; leaf-blades ashy-gray, scaberulous, bi- or tri-pinnate, the secondary pinnae pinnately divided into linear segments ¾ to 1½ lines long; umbels small, the rays 1 to 6 lines long, or the umbels when young subcapitate; flowers white; fruits 3 to 4 lines long; wings plane, about the same width, ½ to 1½ lines wide; oil-tubes "2 to 8 in the intervals, 6 to 22 on the commissure".

Rock crevices, 5000 to 9000 feet: desert ranges of Mono and Inyo Cos. East to southern Nevada. Apr., fr. May-June.

Locs.—Mono Lake (Ann. Mo. Bot. Gard. 17:353); Silver Cañon near Laws, *K. Brandegee;* Bishop, Inyo Co., *Jones;* Pleasant Cañon, Panamint Range, *Jones.*

Refs.—CYMOPTERUS ABORIGINUM Jones, Contrib. W. Bot. 12:22, 27 (1908), type loc. Indian Spr., Charleston Mts., s. Nev., *Jones.* Vars. *ovalis, subternatus* and *oblongus* Jones, l.c., type loc. Bishop, Inyo Co., *Jones. Aulospermum aboriginum* Mathias, Ann. Mo. Bot. Gard. 17:353 (1930).

7. **C. cinerarius** Gray. Plants 2 inches high, the peduncles and leaves from a short more or less horizontal subterranean root-crown; blades of the leaves (in outline) somewhat cordate, bipinnate, with pinnately divided segments, glaucous and cinereous with a very minute harsh pubescence; rays few, short or almost none; involucels of numerous united somewhat membranous long-acuminate segments;

flowers purplish; fruit 2½ lines long, the 5 wings of each carpel rather narrow and thick at insertion; oil-tubes 3 in the intervals, several on the commissure; seed face with narrow and deep concavity.

Dry open slopes and summits, 9000 to 10,500 feet: east slope of the Sierra Nevada in Mono Co.; White Mts. May, fr. July.

Locs.—Summit of a peak near Sonora Pass, Mono Co., *Brewer* 1899; volcanic summit south of Mono Lake, *Brewer* 1825; Cottonwood Creek (head of), White Mts., *Duran* 1645.

Refs.—CYMOPTERUS CINERARIUS Gray, Proc. Am. Acad. 6:535 (1865), type loc. Sonora Pass, *Brewer* 1899; Jepson, Man. 731 (1925); Mathias, Ann. Mo. Bot. Gard. 17:377 (1930). *Aulospermum cinerarium* C. & R. Contrib. U. S. Nat. Herb. 7:178 (1900).

8. **C. littoralis** Gray. Peduncles and leaves spreading or prostrate, arising from very short stems; leaves simply ternate, longer than the peduncles, densely white-tomentose beneath; petioles 2 to 4 inches long; leaflets ovate or roundish in outline, 1 to 2½ inches long, either the terminal or lateral or all 3 leaflets often 3-parted or -divided, their margins callous-serrate or -dentate; umbel compact, hemispherical, resting on the sand; rays ¾ to 1¼ inches long; umbellets capitate; flowers white; bracts and bractlets subulate; fruit dorsally flattened, each carpel bearing 5 equal broad corky wings 1½ to 2 lines wide, the fruit therefore subglobose in outline, 4 to 5 lines in diameter; oil-tubes 2 or 3 in the intervals, 4 or 6 on the commissure; seed face somewhat concave.

Sandy sea-beaches, 2 to 50 feet: Mendocino Co. to Del Norte Co. North to Alaska. May, fr. July-Aug.

Locs.—Pt. Arena, *Davy* 6050; Humboldt Bay, *Chandler* 1145; Crescent City, *Davy* 5960.

Refs.—CYMOPTERUS LITTORALIS Gray, Pac. R. Rep. 12:62 (1860), type loc. Shoalwater Bay, Puget Sound, *J. G. Cooper;* Jepson, Man. 731 (1925). In 1860 this species was adequately and fully published in the Pacific Railroad Report, vol. 12, part 2. The name Cymopterus littoralis had previously been published (Mem. Am. Acad. 6:391,—1859) but only as a nomen nudum. A nomen nudum is of no effect (Int. Rules, sect. 4, arts. 37–38); it is nomenclatorially invalid, as if it had never been published and, consequently, it cannot run against later valid publication of the same name or any other name. Therefore *Glehnia leiocarpa* Mathias, Ann. Mo. Bot. Gard. 15:95 (1928), is a synonym.

33. ERYNGIUM L. Button Snakeroot

Perennials with dichotomously branching stems, clustered coarse fibrous roots, prickly involucres and often prickly leaves. Leaves opposite, or the upper sometimes alternate, commonly oblanceolate and spinulose-serrate or pinnatifid, or the basal, when growing in water, with fistulous petioles and the blade more or less obsolete. Flowers greenish-white or bluish, condensed in heads; heads terminal on the dichotomously cymose branches or on short peduncles in the forks; bracts spinose, conspicuous; bractlets usually spinose-tipped. Calyx-lobes (or sepals) persistent on the fruit. Fruit covered with whitish thin scales; ribs obsolete. Oil-tubes none or obscure.—Species 200, all continents. (Greek name used by Dioscorides.)

Biol. note.—The seeds of Eryngium vaseyi C. & R. germinate in the muddy beds of vernal pools in midwinter. By March well-developed plantlets have formed, and an erect and often dense tuft of slender fistulous jointed petioles emerges from the surface of the water. These phyllodial organs function as green leaves until the shoots begin to appear in April; sometimes the later fistulous petioles develop small blades at apex. With the appearance of shoots, ordinary foliage leaves appear, borne on the lower part of the stem and on its upper part as the stem matures in height. These ordinary leaves are expanded structures more or less irregularly pinnatifid, incised or toothed. With the drying up of the pools in late April or May, the fistulous leaves disappear and the flowers appear. As the pool beds bake under the high insolation of May and June the expanded leaves dry up, so that at maturity of the fruit in July or August the plant is more or less leafless. The succession of events as described varies with the distribution of the rains and the amount of precipitation. In winters of scanty rainfall when the pools do not fill, few or no fistulous leaves are produced. We have grown seed of this species in the ordinary soil of garden beds and the result has been the elimination of the fistulous stage altogether. Expanded leaves were produced immediately.

The life histories of our species of Eryngium as a whole are so slightly known that the specific units as yet cannot well be determined. It is necessary to know well the early stages of the plant and also to accumulate definite knowledge concerning the range of variation in the size and character of the bracts and bractlets which are, on the whole, variable organs. It seems likely that the embryonic blades produced on the phyllodes of Eryngium jepsonii C. & R. are different morphologically from similar organs in Eryngium vaseyi C. & R. It is probable that knowledge of the life history will afford useful facts concerning the phyllodes or early leaves in the case of all species. This field is one for investigation of the life histories in connection with the problems of life areas. It is likely that in the case of aquatic forms the phyllode stages will not be found as variable as the later leaf stages.

Sepals entire.
Heads very blue........1. *E. articulatum.*
Heads greenish, seldom blue.
Blades of lower cauline leaves about 1¼ inches long, the petioles several times as long....2. *E. alismaefolium.*
Blades of lower cauline leaves little or not at all exceeded by the petioles.
Bracts mostly entire (sometimes with a pair of spiny teeth or bristles).
Styles in fruit little or not at all exserted beyond calyx-lobes; bracts and bractlets glabrous.
Stem diffusely branched from base; leaves serrate or incised; bracts callous-margined........3. *E. armatum.*
Stem erect, simple below; leaves twice pinnately parted; bracts scarious-winged at base........4. *E. pinnatisectum.*
Styles in fruit conspicuously exserted beyond calyx-lobes; bracts and bractlets puberulent........5. *E. longistylum.*
Bracts more or less spiny-toothed or bristly.
Plants prostrate or low-diffuse.
Heads short- or long-peduncled, borne in an umbellately dichotomous cyme.
Stems thickened, retrocurved and basally clustered, shorter than the basal leaves; basal leaves pinnatifid........6. *E. minimum.*
Stems slender, freely branched, not clustered at base, longer than the basal leaves; basal leaves oblanceolate, spinose-toothed........7. *E. aristulatum.*
Heads short-peduncled, falsely racemose along the elongated branches of a once-dichotomous cyme........8. *E. racemosum.*
Plants erect or nearly so.
Bractlets not surpassing the flowers, not spiny-toothed........9. *E. jepsonii.*
Bractlets surpassing the flowers, spiny-toothed.
Leaves merely spinose-toothed or somewhat incised; bracts and bractlets spiny-toothed only towards base.
Early phyllodes slender (1 to 2 lines thick); later phyllodes developing laminal segments on the upper part of their axis; bractlets sometimes without scarious margins........10. *E. vaseyi.*
Early phyllodes stout (2 to 5 lines thick); later phyllodes developing a lamina at tip, the laminae cleft or sub-entire; bractlets broadly scarious-margined at base........11. *E. oblanceolatum.*
Leaves pinnatifid, laciniately divided into remote narrow segments; segments spinosely toothed.
Bracts spiny-toothed at base; bractlets usually without spiny teeth........12. *E. parishii.*
Bracts and bractlets spiny-toothed except toward tip........13. *E. castrense.*
Sepals pinnately 3 to 5-cuspidate; leaves pinnately divided into remote narrow segments........14. *E. globosum.*

1. **E. articulatum** Hook. BEE ERYNGO. Stem erect, dichotomously branched above, usually with a pedunculate head in the forks, 2 to 3 feet high; herbage with a strong disagreeable odor; lower leaves fistulous, elongated, jointed, with or without a terminal blade; blade lanceolate or ovate, nearly parallel-veined, entire to spinulose-laciniate; upper leaves sometimes opposite, more or less laciniate; heads ovoid, 4 to 8 lines high, blue; bracts narrowly linear-lanceolate, cuspidate-tipped, more or less spinulose-serrate, 6 to 10 lines long, deflexed; bractlets lanceolate,

entire, or somewhat spiny-toothed, more or less scarious-margined, surpassing the sepals; sepals equaled or surpassed by the styles.

Salt and river marshes and swampy meadows, 0 to 4000 feet: lower San Joaquin River; Sacramento Valley; Trinity, Shasta and Siskiyou Cos. North to Oregon and Idaho. July-Sept.

Locs.—Stockton, *Sanford;* Suisun Marshes, *Jepson* 14,266; Hamilton, Glenn Co., *Heller* 11,558; Nord (1½ mi. s.), Butte Co., *Jepson* 16,610; Red Bluff, comm. *Ethel Wickes;* Redding, *Blankinship;* South Fork Trinity River (near mouth), *Tracy* 7717; upper Fall River Valley, *Jepson* 5756; Sisson, *C. F. Baker* 3819 (cauline leaves like those in E. alismaefolium).

Var. **bakeri** Jepson. Stems simple for more than half their length, then sparsely branched, 1 to 1½ feet high; blades of basal leaves ovate, 1¾ to 2 inches long, the petiole much elongated; heads ovate to globose, bluish, on longish peduncles, 4 to 5 lines high; bracts linear-lanceolate, pinnately spinescent, longer than the heads, spreading or often deflexed; bractlets with a pair of spinose teeth above the middle, scarious-margined at base, equaling or slightly exceeding the sepals; sepals exceeded by the styles.—Modoc Co.

Locs.—Egg Lake; Forestdale, *Baker & Nutting* (heads 5½ lines long, terminal bractlets prominent); Little Grizzly ranger sta., Warner Mts., *L. S. Smith* 163.

Refs.—ERYNGIUM ARTICULATUM Hook. Lond. Jour. Bot. 6:232 (1847), "stony edges of the Spokane River, and Skitsoe and Coeur d'Alene lakes," Ida., *Geyer* 583; Jepson, Fl. W. Mid. Cal. 344 (1901), ed. 2, 289 (1911), Man. 694 (1925). *E. harknessii* Curran, Bull. Cal. Acad. 1:153 (1885), type loc. Suisun Marshes, *Harkness.* Var. BAKERI Jepson, Madroño 1:104 (1923), type loc. Egg Lake, near Larges, Modoc Co., *M. S. Baker,* Aug. 12, 1899; Jepson, Man. 694 (1925).

2. **E. alismaefolium** Greene. Modoc Eryngo. Main stem 1 to 2 inches high, then parted into 3 to 5 diffuse dichotomous branches much shorter than the leaves; basal leaves ½ to 1¼ feet long, consisting of elongated petioles with or without short (1¼ inches long) blades; petioles terete, jointed, passing above into flat spinose ones without joints; upper leaves similar but much smaller; heads usually pedunculate, nearly globose, 3 to 3½ lines high; bracts subulate-lanceolate, usually somewhat longer than the heads, 4 to 5 lines long, with or without a few spinose bristles, somewhat scarious-margined at base; bractlets subulate-lanceolate, a little exceeding the flowers, conspicuously scarious-margined below (the margins broadening downward), with or without a few bristles; sepals scarious-margined, exceeded by the styles.

Moist flats, 4000 to 5500 feet: Modoc Co. North to Oregon. July-Aug.

Loc.—Egg Lake, *M. S. Baker, Baker & Nutting.*

Refs.—ERYNGIUM ALISMAEFOLIUM Greene, Erythea 3:64 (1895), type loc. Egg Lake, Modoc Co., *Baker & Nutting;* Jepson, Man. 694 (1925).

3. **E. armatum** C. & R. Coast Eryngo. Stem diffusely branching, 3 to 5 or 10 inches long; leaves broadly oblanceolate, incised or merely serrate, the teeth spinose; bracts and bractlets very prominent, broadly lanceolate, strongly spinose-tipped, with a callous margin, entire or with a pair of spinulose teeth below, sometimes scarious-winged at the very base, 3 to 7 lines long; sepals usually exceeding the styles.

Dry adobe flats and hills and summits of sea bluffs along the coast, 10 to 90 feet: San Luis Obispo Co. to Humboldt Co.; low valleys bordering San Francisco Bay. June-July.

Geog. note.—Like some other species of the genus the ecological limits of Eryngium armatum are narrow. While most characteristic of the low hills and flats facing the sea, where it is often the dominant on grass lands, it also grows on the flats of low valleys bordering San Francisco Bay. It is never found in the interior. Eryngium pinnatisectum of the Sierra Nevada foothills simulates it only as to the bracts. Extremely abundant on the Point Reyes peninsula, Eryngium armatum is regarded by the cattlemen as an objectionable weed. The earliest leaves are usually pinnately divided with broad (1½ to 2 lines wide) rachis and remote narrow few-toothed or entire segments. About Point Joe on the Monterey coast the heads are very small; northward, especially on the Sonoma and Mendocino coasts, the heads become larger with a corresponding increase in size of the bracts. Sometimes, as on the Sonoma coast, the heads are bluish.

Locs.—Los Osos Valley, San Luis Obispo Co., *Condit;* Pacific Grove, *Jepson* 14,264; Moss

Beach, San Mateo Co., *K. Brandegee* (bracts very broad at base); Berkeley, *H. A. Walker* 197; Richmond, *Jepson* 9732; Pt. Reyes, *Jepson* 1163; Petaluma, *Congdon;* Wilfred sta., Cotati Valley, *Jepson* 9309; Salmon Creek, Sonoma coast, *Jepson* 15,946; Ft. Bragg, *W. C. Mathews* 163; Newport, Mendocino Co., *Jepson* 2212 (styles exserted beyond calyx-lobes; bracts entire or with a spinulose tooth on each side); Shelter Cove, Humboldt Co., *Tracy* 4994 (heads bluish-tinged).

Refs.—ERYNGIUM ARMATUM C. & R. Bot. Gaz. 13:141 (1888); Jepson, Fl. W. Mid. Cal. 343 (1901), ed. 2, 288 (1911), Man. 694, fig. 673 (1925). *E. petiolatum* var. *armatum* Wats. Bot. Cal. 1:255 (1876), based on spms. from Monterey Co. to Humboldt Co. (*Brewer, Samuels, Kellogg*).

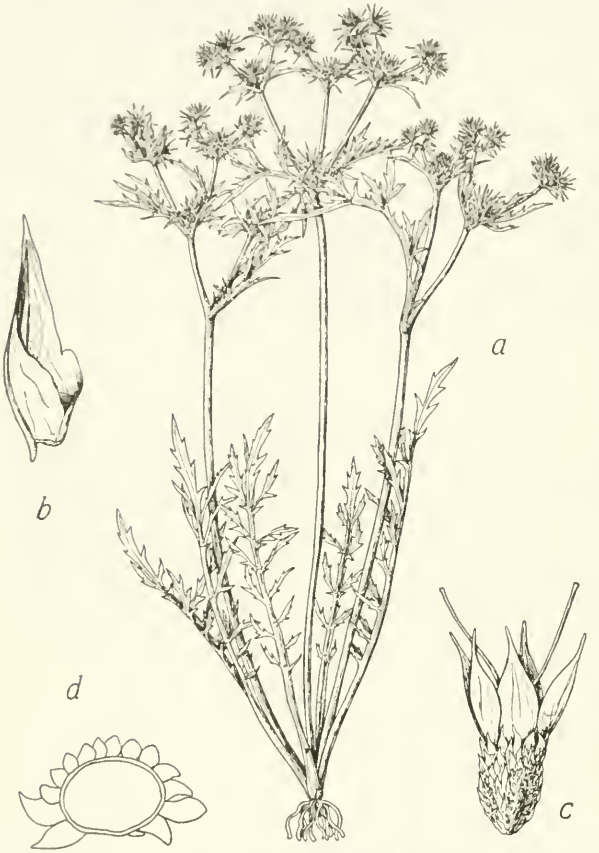


Fig. 271. ERYNGIUM PINNATISECTUM Jepson. *a*, habit, × ¼; *b*, fr. bractlet, × 3; *c*, fr., × 4; *d*, cross sect. of carpel, × 12.

4. **E. pinnatisectum** Jepson. FOOTHILL ERYNGO. (Fig. 271.) Stem erect, branching above, 8 to 14 inches high; basal leaves 3 to 10 inches long, the blades pinnately divided into narrow rather remote segments, the rachis 1 to 2 lines wide, the segments callous-margined, ½ to 2 lines wide, entire or spinulose-toothed or with a few large teeth; petioles flat, winged, short (½ to 2 inches long); upper leaves similar or merely spinose-toothed, the petiole short or lacking; heads 3½ to 4 lines high; bracts entire, 4 to 5 lines long, with wide scarious margin at base forming a lobe or tooth above; bractlets shorter, similar; styles exceeded by sepals.

Summer beds of winter or vernal pools, 1000 to 3000 feet: Sierra Nevada foothills from Amador Co. to Tuolumne Co. May-June.

Locs.—Pine Grove, Amador Co., *Hansen* 391; Copperopolis, Calaveras Co., *Frank Gregory;* Soulsbyville, Tuolumne Co.

Refs.—ERYNGIUM PINNATISECTUM Jepson, Madroño 1:105 (1923), type loc. Duffield Cañon, Soulsbyville, *Jepson* 7690; Man. 695 (1925).

5. **E. longistylum** C. & R. SAN LUIS ERYNGO. Stems low (4 to 8 inches high), branching throughout and spreading; basal leaves narrow, pinnately cut into distant almost spine-like segments; heads globose, about 1¾ lines high; bracts narrowly lanceolate, spreading, minutely puberulent, much longer than the heads, 2¾ to 3¾ lines long, mostly entire, scarious-margined at base; bractlets similar, but narrower, and with broader scarious margins at base; sepals scarious-margined; styles very much longer than the sepals.

Hill country, 20 to 500 feet: San Luis Obispo coast at San Simeon. June.

Refs.—ERYNGIUM LONGISTYLUM C. & R. Contrib. U. S. Nat. Herb. 7:55 (1900), type loc. San Simeon, San Luis Obispo Co., *Curran;* Jepson, Man. 695 (1925).

6. **E. minimum** C. & R. MOUNTAIN ERYNGO. Low, depressed-tufted, the stems several to many, nearly simple, thickened toward the base and markedly retrocurved, 1 to 4 inches long; leaves mostly basal, 2 to 6 inches long, the blades merely cleft and toothed to pinnately divided with cleft or toothed ovatish segments, the segments ½ to 1½ inches long, the teeth and petioles more or less spinose; heads subsessile or on very short peduncles, nearly globose, 2½ to 3½ lines high; bracts broadly lanceolate, equaling or slightly exceeding the heads, the lower ⅔ with spinose bristles; bractlets broadly linear-lanceolate, a little longer than the flowers, with a conspicuous scarious margin below, at the top of which and just above are a few bristles; sepals scarious-margined; styles exceeding the sepals.

Moist flats, 4500 to 6100 feet: northern Sierra Nevada from Nevada Co. to Plumas Co. North to eastern Oregon. July-Aug.

Locs.—Donner Lake, *Sonne, Heller* 7061; Plumas Co., *R. M. Austin.*

Refs.—ERYNGIUM MINIMUM C. & R. Contrib. U. S. Nat. Herb. 7:54 (1900); Jepson, Man. 695 (1925). *E. petiolatum* var. *minimum* C. & R. Rev. N. Am. Umbell. 98 (1888), type loc. Donner Lake, *Sonne. E. articulatum* var. *microcephalum* C. & R. l.c. 99, type loc. Plumas Co., *R. M. Austin.*

7. **E. aristulatum** Jepson. GROUND ERYNGO. Stems prostrate or low-diffuse, very slender, 10 to 15 inches long; basal leaves tapering into a long petiole, 4 inches long (including the petiole), the short blade spinose-toothed and with a few lanceolate segments; cauline leaves opposite, sessile, spinulose-serrate; heads very numerous, 2½ to 3½ lines long; bracts exceeding the head, about 4½ lines long, densely spinescent at base; bractlets spinose, the body narrowly lanceolate, inversely sagittate-winged from the base upward, the lobes of the wings thus forming sinuses, in each of which are borne 1 to 3 awns surpassing the breadth of the wing; sepals hyaline-margined, exceeded by the long styles.

Dry summer flats, wet in winter, 1400 to 3000 feet: Lake Co. July.

Locs.—Mt. Konocti (Uncle Sam Mt.); Boggs Lake, Bottle Glass Mt., *K. Brandegee;* Scotts Valley, *Tracy* 2375 (stems somewhat retrocurved, apparently not prostrate, bracts much longer than heads, sepals rather abruptly cuspidate).

Refs.—ERYNGIUM ARISTULATUM Jepson, Erythea 1:62 (1893), type loc. mts. s. of Uncle Sam Mt., Lake Co., *Jepson* 14,281; Man. 695 (1925).

8. **E. racemosum** Jepson sp. n. Stems slender, decumbent or prostrate, 2 or 3 from the base, 9 to 13 inches long; phyllodes slender, the later ones tipped with nearly entire or merely spinulose-margined blades ¾ to 1½ inches long; cauline leaves mostly bracteal, the blades oblong to lanceolate or oblanceolate, ½ to 1 inch long, the lower petioled, the upper mostly sessile; cymes for the most part only once branched, the branches much elongated, bearing racemosely the small short-peduncled heads; peduncles 2 to 3 lines long; heads 2 to 3 lines high; bracts and bractlets little unequal, surpassing the flowers; bracts spinulose at base, bractlets scarious-margined at base, not spinulose.—(Caules graciles prostrati unc. 9–13 longi; phyllodia gracilia; folia caulina plerumque bracteata; cymae monoramosae, ramis elongatis capitulis parvis racemosis; pedunculi lin. 2–3 longi; capitula lin. 2–3 alta.)

Low flats and river bottoms, 5 to 50 feet: lower San Joaquin Valley. Aug.-Oct.

Locs.—Lathrop, *Bioletti;* San Joaquin City, *Jepson* 10,287 (type).

9. **E. jepsonii** C. & R. BUTTON ERYNGO. Stems slender, erect, freely branching, 1¼ to 1¾ feet high; leaves oblanceolate, often very narrow, spinulose, sometimes incised, the lower narrowed at base to a slender spinulose petiole, the upper short-petioled or sessile; heads 3 to 3½ lines high, much surpassed by the bracts; bracts rigid, 4 to 8 lines long, with few short bristles at base; bractlets lanceolate, all or nearly all shorter than the flowers, not spinulose, the scarious margin at base broadening upwards; sepals exceeded by the long styles.

Wet valley flats, 50 to 500 feet: Contra Costa Co. to Santa Clara Co. Apr., fr. Aug.-Sept.

Locs.—Orinda, San Pablo Creek, *Jepson* 14,275; Berryessa, Santa Clara Valley, *R. J. Smith* 35.

Refs.—ERYNGIUM JEPSONII C. & R. Contrib. U. S. Nat. Herb. 7:54 (1900), type loc. Orinda Park, Contra Costa Co., *Jepson* 14,275; Jepson, Fl. W. Mid. Cal. ed. 2, 289 (1911), excluding synonym, Man. 696 (1925).

ERYNGIUM ELONGATUM C. & R. Contrib. U. S. Nat. Herb. 7:53 (1900), type loc. "near San Francisco", *Vasey* in 1875; bracts becoming reflexed; otherwise much as in E. jepsonii C. & R. (ex char.).

10. **E. vaseyi** C. & R. COYOTE-THISTLE. Plants growing in shallow vernal pools and showing two vegetative stages: earliest leaves all fistulous, jointed, and basal, disappearing with the drying up of the pools and succeeded by leafy stems; stems stout, erect, more or less branching, commonly 8 to 13 inches (or sometimes 2 feet) high; blades of lower leaves narrowly oblanceolate, spinulose, somewhat incised or bearing small lanceolate lobes below, narrowed below to broadly margined petioles, the whole 4 to 8 inches long, the upper much shorter; heads 3½ (or 2½) lines high; bracts spinose, spinulose toward the base, 6 to 10 lines long, much surpassing the bractlets; bractlets similar, surpassing the flowers; sepals longer than the short styles.

Pool beds, water-filled in winter, dry in summer, 25 to 1500 feet: west side Sacramento Valley; Coast Ranges from Mendocino Co. to Monterey Co. May-June, fr. Aug.-Sept.

Locs.—Willows, Glenn Co., *Davy* 4300; Middle Eel River to Round Valley, *Jepson* 14,267; Big Valley, Lake Co., *Jepson* 14,272; Vacaville, *Jepson* 14,161, 14,168; Little Oak, nw. Solano Co., *Jepson* 1197, 14,162, 14,165; Elmira, *Jepson* 14,166; Suscol Hills, s. Napa Co., *Jepson* 14,269. The Vacaville and Elmira spms., cited above, are duplicates of collections, the unicates of which were named by Coulter & Rose as E. vaseyi (Contrib. U. S. Nat. Herb. 7:57). Determinations by us of the other material just cited rest on this initial naming. We have seen no satisfactory material of E. vaseyi from Monterey Co., where the type of the species was collected.

Refs.—ERYNGIUM VASEYI C. & R. Bot. Gaz. 13:142 (1888), type loc. San Antonio River, Monterey Co., *Vasey* 222; Jepson, Fl. W. Mid. Cal. 343 (1901), ed. 2, 289 (1911), Man. 696, fig. 674 (1925).

11. **E. oblanceolatum** C. & R. DOG-THISTLE. Similar in flowering and fruiting habit to E. vaseyi and likewise developing phyllodes in the winter pools; bractlets surpassing the flowers, broadly scarious-margined at base, the outer spiny, the inner entire; styles longer than the sepals.

Winter pool-beds of valley floors, 25 to 1000 feet: Napa Valley; Sonoma Valley; Santa Clara Valley; south to San Luis Obispo Co. Apr.-May.

Locs.—Calistoga, *Jepson* 14,277; St. Helena, *Jepson* 14,270; Yountville, Napa Valley, *Jepson* 14,268; Madrone, Santa Clara Co., *Jepson* 14,271; San Luis Obispo, *Jepson* 3070.

Refs.—ERYNGIUM OBLANCEOLATUM C. & R. Contrib. U. S. Nat. Herb. 7:56 (1900), type loc. Sonoma Valley, *Torrey* 159. *E. californicum* Jepson, Fl. W. Mid. Cal. 343 (1901), type loc. Yountville, Napa Co., *Jepson* 14,279, 14,280. *E. vaseyi* var. *oblanceolatum* Jepson, Madroño 1:107 (1923).

12. **E. parishii** C. & R. MISSION ERYNGO. Stems slender, erect or spreading, much branched at base, ⅓ to 1⅓ feet high; earliest leaves pinnatifid, the segments remote, spinosely toothed or laciniate, the petioles elongated, entire or spiny; next leaves ovate to lanceolate, spinosely toothed, tapering into a long often spiny petiole; inflorescence beginning low and diffusely branching, the heads about 2¾ lines high; bracts narrow and rigid, with a few spinose bristles and with or without a narrow scarious margin at base, 3½ to 6 lines long; bractlets as long, similar but with a short broad scarious margin below, usually without bristles.

Sandy ground or clay depressions, 5 to 500 feet: western San Diego Co. South to Lower California. May, fr. July.

Locs.—Oceanside, *Parish* 4436; San Diego, *Jepson* 1599.

Refs.—Eryngium parishii C. & R. Contrib. U. S. Nat. Herb. 7:57 (1900), type loc. Oceanside, w. San Diego Co., *Parish* 4436. *E. jepsonii* var. *parishii* Jepson, Madroño 1:107 (1923), Man. 696 (1925).

13. **E. castrense** Jepson. Miners Eryngo. Stem stout, very erect, simple below, branched above, 1½ to 1¾ feet high; cauline leaves laciniately divided into rather remote very narrow segments ½ to 1 line wide, these again cleft or toothed, the margin of the divisions and the ligulate rachis markedly or even densely spinose or spinulose; leaves at the upper forks bracteose-foliaceous, pinnately spinose-cleft, somewhat recurving, 1¼ to 1½ inches long; heads mostly short-peduncled or subsessile in the forks, 4 to 5 lines high, once to twice exceeded by the bractlets; foliaceous bracts at base of peduncles often conspicuous; bracts moderately rigid, pinnately spiny-toothed except toward tip, at base more or less scarious-margined and densely spinose dorsally, ¾ to 1 inch long; bractlets similar but with broadly scarious-margined base which encloses the fruit.

Summer beds of former vernal pools, 1000 to 1500 feet: Sierra Nevada foothills from Amador Co. to Mariposa Co. May-June, fr. Aug.

Locs.—Ione, Amador Co., *Braunton* 1014; Copperopolis, Calaveras Co., *Tracy* 5621; Chinese Camp; Sebastopol, Mariposa Co., *Congdon* (reduced form).

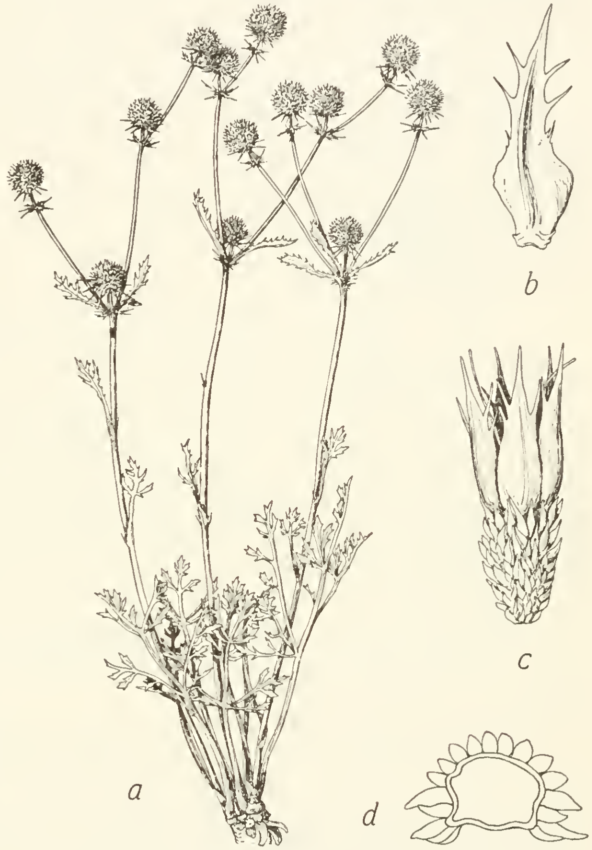


Fig. 272. Eryngium globosum Jepson. *a*, habit, × ¼; *b*, bractlet, × 4; *c*, fr., × 6; *d*, cross sect. of carpel, × 10.

Var. vallicola Jepson. Bracts and bractlets shorter and less markedly spinescent, in this character approaching E. vaseyi.—Adobe soil of rolling plains (50 to 500 feet) bordering the Sierra Nevada foothills from Tehama Co. to San Joaquin Co.

Locs.—Pine Creek road sta., Tehama Co., *Jepson* 12,349; Pentz, Butte Co., *Heller* 11,472; Cana (2½ mi. ne.), Butte Co., *Jepson* 16,616; Chico (e. of), *R. M. Austin* 826 (leaves more coarsely laciniate and less spiny); Lincoln, Placer Co., *Jepson* 10,650; Escalon, se. San Joaquin Co.

Refs.—Eryngium castrense Jepson, Madroño 1:108, fig. 3 (1923), type loc. Chinese Camp, Tuolumne Co., *Jepson* 6319; Man. 697, fig. 675 (1925). Var. vallicola Jepson, Madroño 1:108 (1923), type loc. Escalon, se. San Joaquin Co., *Jepson* 14,278; Man. 697 (1925).

14. **E. globosum** Jepson. Ball Eryngo. (Fig. 272.) Stems 1 to several from base, branching above, 14 to 20 inches high; basal leaves pinnately divided into narrow distant segments, these more or less spinose-toothed or cleft, the petioles spinose-winged and at base somewhat clasping, the whole leaf 5 inches long; cauline leaves similar but smaller with short spinosely winged petiole, the uppermost more

or less bracteose, very spiny at base; forks of the cyme divergent or curved-ascending; heads remarkably globose, mostly on short stout peduncles, 5 lines in diameter, not exceeded by the bractlets except the terminal ones; bracts rigid, spine-tipped and pinnately spinose, somewhat scarious at base, 4 to 5½ lines long; bractlets pinnately 2 or 3-spinose, with broad scarious margin at base, the margin 1 or 2-spinose above; lateral bractlets equaling the flowers, the terminal ones much longer, all falling with the fruit; sepals 1 line long, pinnately 3 to 5-spiny-toothed (rarely entire), the apical spine ½ line long; styles scarcely exserted; fruit 1½ lines long.

Dry (or in the spring, moist) flats, 300 to 1200 feet: Sierra Nevada foothills from Fresno Co. to Tulare Co. and their bordering plains. May, fr. June-Aug.

Locs.—Friant, *Jepson* 12,904; Hospital Rock, Kaweah River, *W. Fry* 302; Kaweah, *Geo. B. Grant* 2894 (immature, some of the heads sessile); Lemon Cove, *Jepson* 558 (heads 6 to 7 lines high; bractlets with 1 to 3 spines at upper edge of scarious margin, a little exceeding the head); Exeter.

Var. **medium** Jepson. Bractlets conspicuously exserted from the heads, in this respect approaching E. vaseyi.—Cathay foothills, Mariposa Co. (one individual with spiny main stem).

Refs.—ERYNGIUM GLOBOSUM Jepson, Madroño 1:108 (1923), type loc. Exeter, Tulare Co., *K. Brandegee*; Man. 697 (1925). Var. MEDIUM Jepson, Madroño 1:108 (1923), type loc. Cathay foothills, Mariposa Co., *Jepson* 8409; Man. 697 (1925).

34. **SANICULA** L. SNAKE-ROOT

Glabrous perennials with naked or few-leaved stems, usually much divided leaves, and irregularly compound, few-rayed umbels. Involucres of leaf-like toothed bracts. Involucels of small usually entire bractlets. Flowers greenish, yellow or purple, of two sorts, perfect (fertile) and staminate (sterile), both kinds in the same umbellet, the staminate often pediceled. Umbellets capitate and here called "heads." Calyx-teeth slightly foliaceous, persistent. Fruit subglobose or obovoid, without ribs, densely covered with tubercles which end in hooked prickles (except nos. 10 and 11). Oil-tubes many and irregularly distributed.—Species 35, all continents except Australia. (Diminutive, derived from Latin sanare, to heal; certain species used in medicine.)

A. Fruit pedicled or stipitate; leaves palmately lobed or divided; stem or stems from a stoutish taproot.

Bractlets conspicuous, much exceeding the heads; plants prostrate or decumbent; coastal.......... 1. *S. arctopoides.*

Bractlets inconspicuous, not exceeding the heads; plants erect.

  Leaf-divisions broad, not toothed to the very base; widespread and common......2. *S. menziesii.*

  Leaf-divisions narrow, decurrent below into a conspicuously toothed rachis; S. Cal. mainly.... 3. *S. arguta.*

B. Fruit neither pedicled nor stipitate.

Stem or stems from the more or less thickened crown of a taproot.

  Flowers purple (yellow in the vars.); leaves bipinnatifid, the main divisions decurrent on the toothed rachis..........4. *S. bipinnatifida.*

  Flowers yellow.

    Leaves entire or some 3-parted; San Francisco Bay..........5. *S. maritima.*

    Leaves not entire.

      Leaves palmately cleft or divided, the main divisions confluent below; coastal.......... 6. *S. laciniata.*

      Leaves ternate, the main divisions on distinct petiolules; montane.

        Plants low, the spreading peduncles arising in a cluster from near the base........ 7. *S. nevadensis.*

        Plants erect, the peduncles arising singly along the stem......8. *S. septentrionalis.*

Stems from a tuberous root.

  Leaves twice or thrice pinnate, of distinct small leaflets; fruit tuberculate, the tubercles tipped with hooked bristles; tuber vertically elongated; widespread species.......... 9. *S. bipinnata.*

  Leaves twice or thrice ternate, then pinnately dissected.

    Tuber globose; fruit tuberculate, not bristly; flowers yellow; widespread species.......... 10. *S. tuberosa.*

    Tuber elongated, fleshy, branched below; fruit with its upper tubercles tipped with bristles; flowers salmon-color; Mt. Diablo and Mt. Hamilton....11. *S. saxatilis.*

1. **S. arctopoides** H. & A. Footsteps-of-spring. (Fig. 273.) Prostrate or decumbent, the plants 4 to 8 inches wide, conspicuous because of the yellowish foliage; main stem from a taproot, very short, ½ to 1 (or 2) inches long, bearing a tuft of leaves and several divergent naked branches often longer than the leaves, each branch bearing an umbel of 1 to 4 rays; rays ¾ to 6 inches long; leaf-blades ¾ to 1¾ inches long, 1½ to 3 inches wide, palmately parted into 3 divisions which are again cleft, the whole margin laciniately cut into slender unequal teeth, almost as if fringed, or again, the lanceolate spreading segments subentire; petioles ½ to 3 inches long; bracts similar to the leaf-blades; heads 3 lines wide, surrounded by conspicuous involucels of 8 to 13 oblong entire bractlets 5 to 7 lines long, or 4 or 5 much shorter than the others; flowers yellow; fruit 1 to 1½ lines long, naked at base, with strong bristles above.

Sandy hills or flats, 5 to 700 feet: Humboldt Bay to Monterey. Mar.-Apr.

Field note.—The staminate flowers are more numerous in the head than the pistillate and somewhat more disposed toward the margin. The bractlets are obscurely in two circles, the larger bractlets 8 or 9, the smaller ones 4 or 5.

Locs.—Samoa, Humboldt Bay, *Tracy* 1018; Mendocino, *H. E. Brown* 734; betw. Stewarts Pt. and Sea View, Sonoma Co., *M. S. Baker* 6; Olema, Marin Co., *Jepson* 14,177; Lake Merced, San Francisco, *Tracy* 1777; Lake San Andreas, *Jepson* 9535; Burlingame, San Mateo Co., *Inez Ray Smith;* Santa Cruz; San Juan grade, *Ferris* 8027; Monterey, *Jepson* 2989.

Refs.—Sanicula arctopoides H. & A. Bot. Beech. 141 (1832), type from Cal., *Lay & Collie;* Hook. Fl. Bor. Am. 1:258, pl. 91 (1834); Jepson, Fl. W. Mid. Cal. 344 (1901), ed. 2, 290 (1911), Man. 698, fig. 676 (1925); Wolff in Engler, Pflzr. 4^{228}:71, fig. 12 (1913).

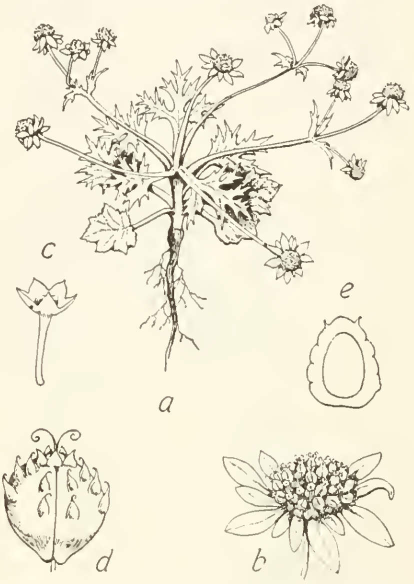


Fig. 273. Sanicula arctopoides H. & A. *a*, habit, × ¼; *b*, head, × 1; *c*, sterile fl., × 5; *d*, fruit, × 5; *e*, cross sect. of carpel, × 5.

2. **S. menziesii** H. & A. Gamble Weed. Stem 1 to 3½ feet high, from a stoutish taproot, simple below, paniculately branching above, leafy; leaf-blades round-cordate in outline, 1 to 3¼ inches wide, palmately and deeply 3 to 5-lobed, the broad segments sharply lobed or incised, with bristle-tipped teeth; petioles 1 to 8 inches long; rays few, ¼ to 2 inches long; bracts small, leaf-like; bractlets 6 to 8, small, entire; flowers yellow, the sterile ones short-pediceled or nearly sessile; fruits covered with strong bristles, 1½ lines long, distinctly stipitate, 4 to 9 in each head, at length divergent.

Shady woods of foothills or valley flats, 5 to 1500 (or 3200) feet: cismontane Southern California; Sierra Nevada from Tulare Co. to Shasta Co.; Sacramento Valley; Coast Ranges from San Luis Obispo Co. to Humboldt Co. North to British Columbia. Apr.-May, fr. June-July.

Locs.—Cismontane S. Cal.: Descanso, San Diego Co., *T. Brandegee;* Ramona, *T. Brandegee;* Waterman Cañon, San Bernardino Mts., *Parish;* Monrovia Cañon, San Gabriel Mts., *Peirson* 431; Los Alisos Cañon, Santa Monica Mts., *Epling;* Ojai Valley, *Hubby* 3; Santa Barbara, *Nuttall;* Lompoc, Santa Barbara Co., *Munz* 10,254; Ft. Tejon, *Davy* 2363. Sierra Nevada: Barnafee Flat, Tulare Co., *W. Fry* 128; Mariposa Co. (Zoe 3:29); Tuttletown, Tuolumne Co., *Tracy* 5690; Gwin Mine, Calaveras Co., *Jepson* 1764; Willow Sprs. sta., Amador Co., *Jepson* 15,231; Newcastle, Placer Co., *M. E. P. Ames.* Sacramento Valley: South Peak, Marysville Buttes, *Jepson* 14,188; Vina, Tehama Co., *Heller* 11,332; Crane Creek, w. Tehama Co., *Jepson;* Redding, *Blankinship.* Coast Ranges: San Luis Obispo, *Roadhouse;* Pacific Grove, *Heller* 6824; Stanford, *C. F.*

Baker 714; Pine Cañon, Mt. Diablo, *Chandler* 952; Berkeley, *Jepson* 6225; South Fork Mill Creek, Miyakma Range, *Jepson* 3019; Bull Creek, Humboldt Co., *Jepson* 16,457; Buck Mt., Humboldt Co., *Tracy* 2748.

The following are minor variations: Var. NUDICAULIS Jepson. Branches about 10, sub-basal, somewhat scapiform; leaves long-petioled, thinnish, less deeply parted, sinuses more nearly closed and the segments less lobed.—Coast Ranges, *Douglas;* Amador Co., 900 feet, *Hansen* 1451. Var. PEDATA Jepson. Robust, 3 to 5 feet high; leaves thickish, dark green, pedately divided into cuneate segments (especially the cauline), 3 to 4 inches broad, the teeth bristle-tipped.—North Coast Ranges: Elk Mt., n. Lake Co., *Tracy* 2274; Calistoga. Var. FOLIACEA Jepson. Low but very leafy, the bracteal leaves very large.—San Francisco Bay, *Hartweg* 199; Kelseyville, Lake Co.

Refs.—SANICULA MENZIESII H. & A. Bot. Beech. 142 (1832), type from Cal., *Lay & Collie;* Hook. Fl. Bor. Am. 1:258, t. 90 (1834); Jepson, Fl. W. Mid. Cal. 345 (1901), ed. 2, 290 (1911), Man. 698, fig. 677 (1925). *S. crassicaulis* var. *menziesii* Wolff; Engler, Pflzr. 4^{228}:70 (1913). Var. NUDICAULIS Jepson, Fl. W. Mid. Cal. ed. 2, 290 (1911), Man. 699 (1925). *S. nudicaulis* H. & A. l.c. 347 (1840), type from Cal., *Douglas.* Var. PEDATA Jepson, Madroño 1:111 (1923), type loc. Calistoga, *Jepson* 14,189; Man. 699 (1925). Var. FOLIACEA Jepson, Madroño 1: 111 (1923), type loc. Kelseyville, Lake Co., *Irwin* 127; Man. 699 (1925).

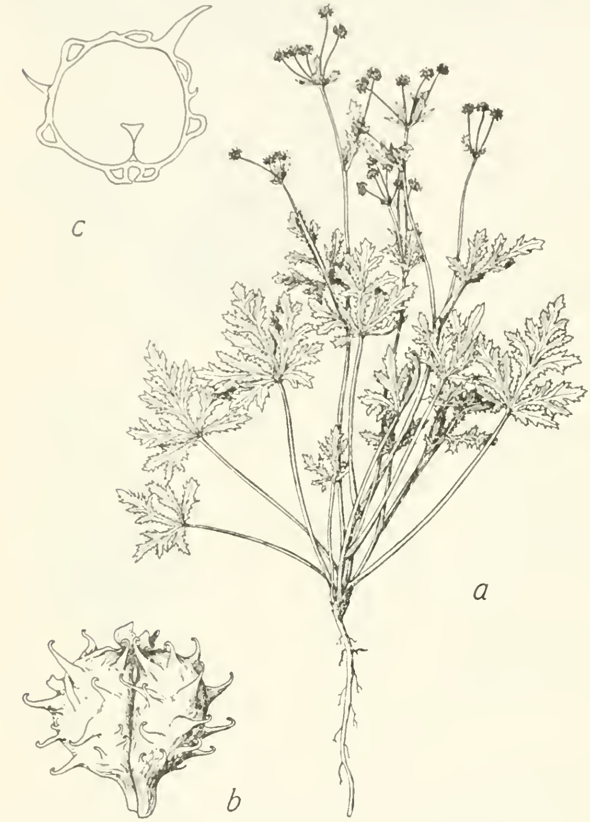


Fig. 274. SANICULA ARGUTA Greene. *a*, habit, × ¼; *b*, fr., × 4½; *c*, cross sect. of carpel, × 7½.

3. **S. arguta** Greene. LITTLE-JIM SANICLE. (Fig. 274.) Stems sparingly branched, from the crown of a thickened taproot, 8 to 13 (or 18) inches high; leaves mainly basal, the blades 1 to 3½ inches long, palmately 5 to 7-divided, the middle division largest and often distant, the lower pair of divisions smaller than the lateral pair, all more or less pinnately parted or cleft and toothed and each decurrent to the base, forming a broad toothed wing; ultimate segments 2 to 3 lines wide, darkly reticulate-venulose beneath; midribs and upper side of petioles minutely or slenderly glandular-papillate; petioles 2 to 5 inches long; cauline and bracteal leaves reduced or sometimes large; rays 3 to 6, subequal, 1 to 4 inches long; flowers yellow, the heads 2 to 4 lines broad; bractlets membranous, oblong, acute, not exceeding the heads; fruit prickly, 2½ lines long, stipitate.

Sandy flats, 5 to 2000 feet: cismontane Southern California from San Luis Obispo Co. to San Diego Co. Mar.-Apr.

Locs.—Cuesta Pass, Santa Lucia Mts., *Jepson* 11,965; Las Cruces, Santa Inez Mts., *Jepson* 11,918; Santa Barbara, *Elmer* 3930; Pelican Bay, Santa Cruz Isl., *Jepson* 12,120; Saugus, *Davy;* Ojai Valley, *Hubby* 14; Santa Susanna Pass, *Jepson* 8467; Santa Monica, *Barber* 115; Pasadena, *Geo. B. Grant* 1174a; Santa Catalina Isl., *Blanche Trask;* San Clemente Isl., *Munz* 6659; Escondido, *Abrams* 3353; Ramona, *Jepson* 8522; Julian, e. San Diego Co., *K. Brandegee;* Soledad Mt., *Lowell Sumner;* El Cajon, *T. Brandegee;* San Diego, *Jepson* 6664.

Refs.—Sanicula arguta Greene; C. & R. Contrib. U. S. Nat. Herb. 7:36 (1900), type loc. San Diego, *Pringle;* Wolff in Engler, Pflzr. 4^{228}:73 (1913); Jepson, Man. 699 (1925).

4. **S. bipinnatifida** Dougl. Purple Sanicle. Plants ½ to 1 foot high, the herbage disposed to be purplish; taproot deep-seated, the root-crown bearing a cluster of leaves and several stems which are leafy mainly or wholly toward the base; leaf-blades 1½ to 4 (or 7) inches long, mostly triangular in outline, pinnately 3 to 7-parted, the oblong or ovate divisions discrete, serrate, unequally toothed or pinnately lobed, and decurrent on the rachis as a toothed wing; petioles 1¼ to 2½ (or 4¾) inches long; umbels irregular, with long or short rays, small leaf-like bracts and small lanceolate bractlets; flowers purple, the sterile pediceled, borne in dense heads 2½ to 4 lines in diameter; fruit covered all over or mostly at apex with bristles, these pustulate-dilated at base.

Grassy open slopes or open woods in the hills, 5 to 3500 feet: coastal Southern California; Sierra Nevada foothills; Coast Ranges. North to British Columbia. Apr.

Geog. note.—Sanicula bipinnatifida is the most widely distributed and the most common species of its genus in California. A characteristic vernal plant of the open grassy foothills, it is also occasionally found in the rolling gravelly or clay plains of the Great Valley bordering the foothills, but probably never occurs on its loamy flood plains. The leaves are unusually variable, even for a Sanicula species, especially in size, shape and degree of toothing or segmentation of the divisions. The divisions are usually distant or sometimes only discrete; the rachis wing is very wide or very narrow (1½ to 7 lines wide, including the teeth) and very variously toothed. Fine segmentation of the leaves is more common in the Coast Ranges than in the Sierra Nevada foothills. As to seedlings some of the earliest leaves are unsegmented and merely serrate.

Locs.—S. Cal.: Cuyamaca Mts., *Hall;* El Cajon, *T. Brandegee;* Banning, *Gilman;* San Bernardino, *Parish* 1998; San Dimas, *Chandler.* Tehachapi Mts.: Rowen, *Jepson* 6712. Sierra Nevada foothills: Lindsay, Tulare Co., *Munz* 9089; Rattlesnake Gulch, e. of Friant, Fresno Co., *Jepson* 15,104; Northfork, Madera Co., *Jepson* 12,874; Guadalupe Mts., Mariposa Co., *Jepson* 10,739; Gwin Mine, Calaveras Co., *Jepson* 1782; Columbia, Tuolumne Co., *Jepson* 6289; Ione, Amador Co., *Jepson* 15,207; Auburn, *M. E. P. Ames;* Oroville, *Heller* 11,206; Goose Valley, Shasta Co. *M. S. Baker.* Coast Ranges: Slack Creek, Monterey Co., *Jepson* 12,039; Paso Robles, *Condit* 228; San Juan grade, *Ferris* 7492; Coyote, Santa Clara Co., *Jepson* 14,182; Mt. Hamilton, *Jepson* 4212; Arroyo Mocho, s. Alameda Co., *Jepson* 10,681; Berkeley Hills, *Anna Lewis & Jennie Robinson;* Chiles Creek, Napa Range, *Jepson* 6267; Kelseyville, Lake Co., *Irwin* 28; Lodoga, w. Colusa Co., *Jepson* 16,273; Round Valley, ne. Mendocino Co., *Westerman;* Kneeland Prairie, Humboldt Co., *Tracy* 3056. Great Valley: Tulare, *Davy;* Orosi, e. of Dinuba, *H. P. Kelley;* Califa, Madera Co., *Jepson* 15,164; Violet sta., nw. Solano Co., *Jepson* 1200; Fair Oaks, Sacramento Co., *Ramaley* 11,042; Rosewood, w. Tehama Co., *Jepson* 14,181; Redding, *Blankinship.*

Var. **flava** Jepson. Leaves mostly light green with broad primary divisions (¾ to 1½ inches wide); flowers yellow.—Northern Sierra Nevada: betw. Clear Creek and Paradise, Butte Co., *Heller & Brown* 5539; Kress, Nevada Co., *Hall & Essig* 10,196; New York Falls, Amador Co., *Hansen* 1298; Columbia, Tuolumne Co., *A. L. Grant* 681.

Specimens erroneously labeled by E. L. Greene as S. nemoralis at about the time of publication by him of that name are unquestionably the form of S. bipinnatifida described in the Manual as var. nemoralis Jepson which is here taken as the equivalent of var. flava. The true S. nemoralis Greene is a form of S. septentrionalis Greene.

Refs.—Sanicula bipinnatifida Dougl.; Hook. Fl. Bor. Am. 1:258, t. 92 (1834), type loc. Ft. Vancouver on the Columbia River, *Douglas, Scouler;* Jepson, Fl. W. Mid. Cal. 345 (1901), ed. 2, 290 (1911), Man. 699, fig. 678 (1925). Var. flava Jepson, Madroño 1:112 (1923), type loc. Marston sta., Plumas Co., *Heller* 10,839; Man. 699 (1925). *S. bipinnatifida* var. *nemoralis* Jepson, Madroño 1:112 (1923), Man. 699 (1925); not S. nemoralis Greene (1893).

5. **S. maritima** Kell. Dobie Sanicle. Plants 10 to 12 inches high, the stout stem from a much-thickened root; basal leaves many, the blades elliptical to orbicular, entire or slightly serrate, 1 to 2½ inches long, on petioles 4 to 6 inches long; cauline leaves few, 3-parted into obovate or roundish divisions (as are sometimes the basal leaves), with sub-entire or coarsely toothed margins; peduncles few, elongated; umbel with 1 to 4 rays 1 to 3½ inches long; involucre of leaf-like bracts; involucel of many small lanceolate bractlets; flowers yellow, the sterile ones short-pediceled; fruit bristly, somewhat naked below, 1½ lines long; seed-face concave with a very prominent median longitudinal ridge.

Low adobe flats bordering salt marshes, 0 to 20 feet: east and west sides of San Francisco Bay south of the Golden Gate. Apr.

Locs.—Potrero, San Francisco, *E. Cannon;* Alameda, *Greene.*

Refs.—SANICULA MARITIMA Kell.; Wats. Bot. Cal. 2:451 (1880), type loc. about San Francisco, *Kellogg;* Jepson, Fl. W. Mid. Cal. 345 (1901), ed. 2, 291 (1911), Man. 699 (1925).

6. **S. laciniata** H. & A. COAST SANICLE. (Fig. 275.) Plants 6 to 13 inches high; stem from a medium taproot, the branches few and disposed to diverge; leaves mainly basal, the blades orbicular in outline, ½ to 1 inch long, palmately 3-cleft or -parted, the divisions incisely lobed or laciniate with spreading teeth, the petioles 1 to 2 inches long; upper leaves and foliaceous involucres similar but reduced; umbel with 2 to 5 unequal rays (⅓ to 1½ inches long) or 1 or 2 of the rays again umbellate; flowers yellow, subtended by an involucel of oblong-ovate or lanceolate bractlets 1 line long; sterile flowers long-pediceled; fruit prickly, somewhat naked below, 1½ lines long.

Openly wooded slopes or flats, 5 to 1000 feet: coastal hills from Humboldt Co. to Monterey Co. Apr.

Locs.—Miranda, South Fork Eel River, *Tracy* 6950; Garberville, *Tracy* 6163; Navarro, Mendocino Co., *Edith Byxbee* (blades of earlier leaves sometimes circular-cordate, nearly entire); Franz Valley grade, upper Napa Valley, *Jepson* 14,186; Mt. Tamalpais, *Jepson* 1191; Stanford, *C. F. Baker;* Monterey, *Jepson* 2988.

Var. **serpentina** Jepson. Leaves 1 to 1½ inches long, palmately 3-parted or -divided, the lobes pinnately parted into often remote lanceolate segments, these entire or laciniately toothed.—Monterey Co. (Pacific Grove, *Heller* 6479) to San Mateo Co. (Portola, *Elmer* 4498) and Marin Co. (Liberty, *Chesnut & Drew*).

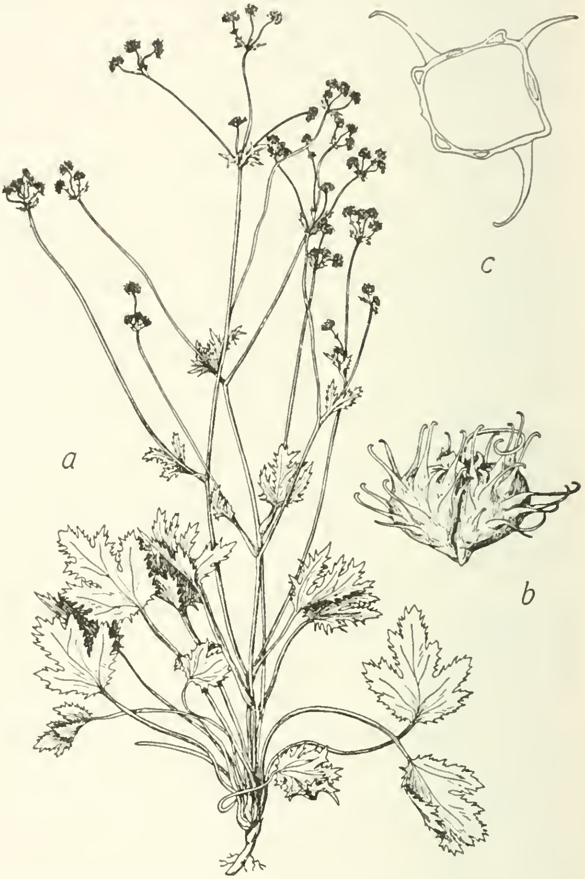


Fig. 275. SANICULA LACINIATA H. & A. *a*, habit, × ½; *b*, fr., × 6; *c*, cross sect. of carpel, × 9.

Refs.—SANICULA LACINIATA H. & A. Bot. Beech. 347 (1840), type from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. 345 (1901), ed. 2, 291 (1911), Man. 700 (1925). Var. SERPENTINA Jepson, Madroño 1:113 (1923), Man. 700 (1925). *S. serpentina* Elmer, Bot. Gaz. 41:312 (1906), type loc. Portola, San Mateo Co., *Elmer* 4498.

7. **S. nevadensis** Wats. SIERRA SANICLE. Low plants, with several spreading peduncles 1 to 6 (or 9) inches long arising basally or from the very short (1 to 2 inches long) stem; leaf-blades ternate, ½ to 1 inch long, the divisions with distinct petiolules, oblong-ovate to suborbicular in outline, 3 to 5-lobed with the segments again toothed or incised; petioles ½ to 2½ inches long; rays 3 to 10 in an umbel, 1 line to 1 inch long, the bracts pinnatifid, leaf-like; bractlets small, oblong, acute,

more or less united; flowers yellow, the sterile on pedicels 1 to 1½ lines long; fruit tuberculate, the tubercles gradually attenuate into a thick-subulate bristle hooked at tip.

Openly wooded slopes, 5000 to 6000 feet: Sierra Nevada from Modoc Co. to Mariposa Co.; Coast Ranges from Siskiyou Co. to Humboldt Co.; Tehachapi Mts.; San Bernardino Mts. Apr.-June.

Locs.—Sierra Nevada: Deep Creek, Warner Mts., e. Modoc Co., *L. S. Smith* 1124; Forestdale, sw. Modoc Co., *Baker & Nutting;* Sierra Valley, *Lemmon;* Prosser Creek near Truckee, *Sonne;* Tahoe, Placer Co., *Sonne;* Mariposa Co. (Zoe 3:319). Coast Ranges: Humbug divide, Siskiyou Co., *Butler* 623; Devils Backbone, sw. Siskiyou Co., *Jepson* 2068; Willow Creek, n. Humboldt Co., *Tracy* 7448; Red Rock, ne. Mendocino Co., *Cronemiller* 609. Tehachapi Mts.: Bear Mt., *Jepson* 7176. San Bernardino Mts.: Long Pt., *Parish.*

Var. **glauca** Jepson. Leaves glaucous, very finely divided.—Rocky slopes: Tulare Co. (Middle Tule River, *Purpus* 1804) and Kern Co. (Piute Pass).

Refs.—SANICULA NEVADENSIS Wats. Proc. Am. Acad. 11:139 (1876), type from Plumas Co., *M. E. P. Ames, Lemmon;* Jepson, Man. 700 (1925). Var. GLAUCA Jepson, Madroño 1:113 (1923), type loc. Piute Pass, Kern Co., *Purpus* 5093; Man. 700 (1925).

8. **S. septentrionalis** Greene. MOUNTAIN SANICLE. Plants erect, 6 to 12 inches high; taproot thickened but not tuberous; leaf-blades suborbicular in outline, ½ to 1 (or 1½) inches long, pinnately divided into 5 divisions, the divisions pinnately divided or toothed; petioles ¼ to 1 (or 2½) inches long; peduncles few, divaricately spreading, scattered along the stem; rays 3 or 4, 2 to 7 lines long; heads 1½ to 2 lines long; flowers whitish; fruit 2 lines long, covered with subglobose tubercles, the tubercles abruptly tipped with a slender uncinate bristle.

Moist wooded slopes or rocky summits, 5000 to 8000 feet: Sierra Nevada from Nevada Co. to Modoc Co.; upper Sacramento Valley; high North Coast Ranges from Trinity Co. to Siskiyou Co. North to British Columbia. June.

Locs.—Sierra Nevada: Mineral, Tehama Co., *Jepson* 12,327; Big Valley Mts., Modoc Co., *Baker & Nutting.* North Coast Ranges: South Yollo Bolly, *Jepson* 14,187; Trinity Summit, *Jepson* 2046; Dorleska, Trinity Co., *Hall* 8587; Shackelford Creek, Siskiyou Co., *Butler* 54, 1778. Some collections made in Shasta Co., on the upper Sacramento River (Anderson, *Alice King;* Coram, *Blankinship*) are from extremely low altitudes (400 to 700 feet) and are of doubtful status; for this and for other reasons the content of this group needs further investigation.

Var. **nemoralis** Jepson comb. n. Peduncles much elongated (4 to 11 inches long), disposed to be sub-basal; fruit pustules subglobose, ending in a bristle about as long.—Sierra Nevada, 4700 to 7000 feet: Blue Cañon, Placer Co., *H. A. Walker* 1239; Mariposa Big Trees, *Bolander;* betw. Colony Mill and Marble Fork, Tulare Co., *Jepson* 656.

Refs.—SANICULA SEPTENTRIONALIS Greene, Erythea 1:6 (1893), type loc. Chase River, Vancouver Isl., *Macoun;* Wolff in Engler, Pflzr. 4^{228}:74, fig. 14 (1913); Jepson, Man. 700 (1925). *S. divaricata* Greene, Erythea 3:64 (1895), type loc. Castle Peak, Nevada Co., *Greene.* Var. NEMORALIS Jepson. *S. nemoralis* Greene, Erythea 1:6 (1893), type loc. Mariposa Big Trees, *Bolander.*

9. **S. bipinnata** H. & A. POISON SANICLE. Stem from an elongated tuber-like root, erect, usually simple below, ⅔ to 2 feet high; herbage with a strongly aromatic odor; leaves chiefly basal, 2 to 7 inches long, the blades twice or thrice pinnate, the ultimate divisions obovate or oblong, 3 to 4 lines long, not decurrent; umbel with 3 or 4 rays and leaf-like bracts; flowers yellow, the heads 2 lines wide, and subtended by several small more or less united bractlets; fruit tuberculate, the tubercles tipped with stout hooked bristles.

Openly wooded low hills and valley flats, 20 to 2200 feet: Sierra Nevada foothills from Butte Co. to Kern Co.; Sacramento Valley; Coast Ranges from Humboldt Co. to San Luis Obispo Co.; south to the San Gabriel Valley. May.

Locs.—Sierra Nevada foothills: Little Chico Creek, Butte Co., *R. M. Austin;* Oroville, *Heller* 10,707; Cabbage Patch, Yuba Co., *Jepson* 14,180; Ione, Amador Co., *Jepson* 15,209; Calaveritas Creek, Calaveras Co., *Tracy* 5680; Mormon Bar, Mariposa Co., *Jepson* 12,770; Kaweah, *Eastwood.* Sacramento Valley: Anderson, *Alice King;* College City, Colusa Co., *Alice King;* Mills sta., n. Sacramento Co., *Jepson* 15,732. Coast Ranges: Buck Mt., Humboldt Co., *Tracy* 2740; Araquipa Hills, w. Solano Co., *Jepson* 14,178; Mt. Diablo, *Jepson* 10,695; Stanford, *C. F. Baker* 496; Loma

Prieta, Santa Cruz Mts., *Davy* 579; Paso Robles, *Barber;* Zapato Cañon, sw. Fresno Co., *Jepson* 15,375; Pozo, San Luis Obispo Co., *Condit.* Tehachapi Mts.: Rowen, *Jepson* 6743. Coastal S. Cal.: Sulphur Mt., Ventura Co., *Epling & Anderson;* Ojai Valley, *Hubby* 16; Pasadena, *McClatchie* 1.

Refs.—SANICULA BIPINNATA H. & A. Bot. Beech. 347 (1840), type from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. 346 (1901), ed. 2, 291 (1911), Man. 700, fig. 679 (1925); Wolff in Engler, Pflzr. 4^{228}:76, fig. 15 (1913).

10. **S. tuberosa** Torr. TURKEY PEA. Stem from a globose tuber, 5 to 9 (or 14) inches high, simple or divided at or near the surface of the ground into 2 to 5 long peduncle-like often divergent branches, each irregularly di- or tri-chotomous, the divisions ending in 1 to 4-rayed umbels and commonly also with pedicellate heads in the forks; leaves once or twice ternate, then pinnatifid, usually very finely dissected into acutish segments 1 to 3 lines long; involucres of leaf-like bracts; involucels of small ovate or lanceolate partially united bractlets; heads 2 to 3 lines wide; flowers yellow, the sterile on pedicels 1 to 2½ lines long; fruit flattened laterally, tuberculate but not at all bristly, 1 line long.

Grassy opens or wooded or brushy slopes, 500 to 5000 (or 8600) feet: Sierra Nevada from Lassen Co. to Fresno Co.; Coast Ranges from Tehama and Humboldt Cos. to Santa Clara Co.; cismontane Southern California. South to Lower California. Mar.-June, fr. May-July.

Locs.—Sierra Nevada: Norval Flat, sw. Lassen Co., *Robinson* 12; Warner Valley, Plumas Co., *Jepson* 4067; Goodyears Bar, Sierra Co., *L. S. Smith* 1579; Deer Creek ridge near Rough & Ready, Nevada Co., *Jepson* 14,191; Carson Pass, acc. *Mason;* Armstrong sta., Amador Co., *Hansen* 1117; Gwin Mine, Calaveras Co., *Jepson* 1805; Belle Mdw., Tuolumne Co., *Jepson* 6490; Curtin Mdws., Mariposa Co., *Jepson* 10,530; Rattlesnake Gulch, e. of Friant, Fresno Co., *Jepson* 15,109. Coast Ranges: Redding, *Blankinship;* Crane Creek, w. Tehama Co., *Jepson* 14,195; South Yager Creek, Humboldt Co., *Tracy* 6528; Larrabee Valley, Humboldt Co., *Tracy* 7037; Lodoga, w. Colusa Co., *Jepson* 16,274; Mt. St. Helena, *Jepson* 14,190; St. Helena, *Jepson* 14,192; Mt. Diablo, *Jepson* 9663; Mt. Day, Mt. Hamilton Range, *R. J. Smith.* Cismontane S. Cal.: Eaton Cañon, San Gabriel Mts., *Peirson* 422; Reche Cañon, San Bernardino Valley, *Parish;* Santa Ana hills, *Parish;* Fallbrook, San Diego Co., *Jones;* Foster, San Diego Co., *T. Brandegee.* The odor of the herbage is very strong, somewhat spicy but very penetrating.

Refs.—SANICULA TUBEROSA Torr. Pac. R. Rep. 4:91 (1857), type loc. Duffield Ranch, Confidence, Tuolumne Co., *Bigelow;* Jepson, Fl. W. Mid. Cal. 346 (1901), ed. 2, 291 (1911), Man. 700, fig. 680 (1925); Wolff in Engler, Pflzr. 4^{228}:78, fig. 16 (1913).

11. **S. saxatilis** Greene. DEVIL'S SANICLE. Stems several, branching and widely spreading from the base, 4 to 7 inches long; root globose or elongated but often irregular, 1 to 1½ inches long, ⅓ to 1 inch thick; ultimate leaf-segments broad, coarsely toothed; flowering branches repeatedly dichotomous; flowers straw-color; fruit tuberculate, the upper tubercles tipped with a reduced and slightly curved thick-based bristle.

Rocky summits, 3000 to 3800 feet: Mt. Hamilton Range; Mt. Diablo. May.

Field note.—This extremely restricted endemic has thus far been reported only from Mt. Hamilton (betw. Aquarius Spr. and Murietta Spr., *Helen Sharsmith* 923) and from the summits of Mt. Diablo, namely, the west peak (*Jepson* 9207), saddle between east and west peaks (*Bowerman*) and a point above Deer Flat (*Bowerman*). The odor of the fresh herbage is very intense and penetrating. The tubers are often globose or subglobose, or again irregular in shape because of the character of the rock crevices in which they are found.

Refs.—SANICULA SAXATILIS Greene, Erythea 1:6 (1893), type loc. Mt. Diablo, *Greene;* Jepson, Fl. W. Mid. Cal. ed. 2, 291 (1911), Man. 701 (1925).

35. **ANTHRISCUS** Bernh.

Annual herb. Leaves bipinnate with bipinnatifid leaflets, the upper leaves reduced. Flowers white. Umbels compound, lateral, shortly peduncled or sessile. Rays few. Involucre none. Involucel of few lanceolate bractlets. Fruit somewhat laterally compressd, ovate, shortly beaked, curved with short hooked bristles. Ribs and oil-tubes none or obscure.—Species 13, Europe, Asia and Africa. (Greek anthriscus, its etymology unknown.)

1. **A. vulgaris** Pers. Bur Chervil. Slender, 1½ to 3 feet high; rays 3 to 6, ½ to 1 inch long; pedicels 1 to 3 lines long; fruit 1¾ lines long.

European weed, occasionally introduced about towns in the Coast Range valleys. Apr.

Locs.—Cloverdale, *Tracy* 5799 in 1921; St. Helena, *Clara A. Hunt* in 1908; Jolon, *K. Brandegee* in 1909.

Refs.—Anthriscus vulgaris Pers. Syn. 1:320 (1805); Jepson, Man. 701 (1925). *Scandix anthriscus* L. Sp. Pl. 257 (1753), type European. *A. anthriscus* Karst. Deutsch. Fl. 857 (1880–83).

36. SCANDIX L.

Annuals with dissected decompound leaves. Flowers white, polygamous, in compound umbels. Rays commonly 2, rarely 1 or 3. Involucre none or of one bract. Involucels of several bractlets. Staminate flowers with stamens and green disk, and occasionally with short styles; pistillate flowers with long styles, purple disk and with or without stamens. Petals unequal, the outer larger. Fruit linear, flattened laterally, muriculate, prolonged into a beak several times longer than the body. Ribs prominent. Oil-tubes none or obscure. Seed-face sulcate.—Species 15, Europe, Asia and north Africa. (The ancient Greek name for the chervil.)

1. **S. pecten-veneris** L. Shepherd's Needle. Erect, simple or branching, 5 to 16 inches high, somewhat hispidulous; leaves 2 or 3 times pinnately dissected into linear acute segments less than ½ line wide; bractlets 2 or 3-toothed at apex or entire; rays ½ to 1 inch long; pedicels very short; body of fruit 4 lines long, bearing a straight flattish beak 1¾ inches long, its edges hispidulous.

Naturalized from Europe in valleys and foothills, 5 to 500 feet: San Francisco Bay region to Humboldt Co. Apr., fr. June.

Locs.—Garberville, s. Humboldt Co., *Tracy* 6342; Santa Rosa, *Eastwood* in 1893; Oak Knoll sta., Napa Valley, *Jepson* 14,242 in 1893; Napa Jct., *Jepson* 9625 in 1922; Olema, *Jepson* in 1910, Berkeley, *Jepson* in 1891.

Refs.—Scandix pecten-veneris L. Sp. Pl. 256 (1753), type European; Jepson, Fl. W. Mid. Cal. 346 (1901), ed. 2, 292 (1911), Man. 701, fig. 681 (1925).

37. OSMORRHIZA Raf. Sweet Cicely

Perennials with thick aromatic roots. Leaves mostly basal, 2 to 3 times ternately compound. Flowers white, in compound umbels. Calyx-teeth obsolete. Involucre reduced or obsolete. Involucels present or none. Fruit linear or linear-oblong, rather prominently attenuate at base, glabrous and smooth or bristly along the ribs; carpels pentagonal in cross section, with equal ribs. Oil-tubes none in mature fruit. Seed-face concave to very deeply sulcate.—Species 13, Asia and North and South America. (Greek osme, odor, and rhiza, root.)

Fruit with bristly ribs; carpel long-attenuate at base (except no. 1).
  Involucels of several bractlets.....1. *O. brachypoda.*
  Involucels none.
    Fruit beaked or constricted at apex.....2. *O. nuda.*
    Fruit obtuse at apex.....3. *O. obtusa.*
Fruit-ribs not bristly; carpel not attenuate (mostly obtuse) at base.
  Fruiting rays usually erect, forming a compact cluster of fruits; leaflets oblong-lanceolate.....4. *O. occidentalis.*
  Fruiting rays spreading, forming a loose umbel; leaflets ovate.....5. *O. bolanderi.*

1. **O. brachypoda** Torr. California Cicely. (Fig. 276.) Stems erect, 1½ to 1¾ feet high; herbage hirsutulose or the stems and petioles with short spreading hairs, or the stems glabrous; leaflets ovatish, coarsely laciniate-cleft and serrate, mucronulate, ¾ to 2 inches long; umbel 1 to 5-rayed, the fruiting rays 2 to 4

inches long; pedicels 1 line long; involucre mostly absent; involucels present, their bractlets linear, acuminate, in fruit usually spreading or often closely reflexed; fruit 7 to 9 lines long, the ribs armed with bristles pointed upward; seed-face deeply concave or even involute.

Shady woods: Sierra Nevada, 4000 to 8500 feet, from Sierra Co. to Tulare Co.; South Coast Ranges, 800 to 3200 feet, from Santa Clara Co. to San Luis Obispo Co.; coastal Southern California, 1000 to 3500 feet. Apr., fr. June-July.

Locs.—Sierra Nevada: Downieville (Pac. R. Rep. 4^{5}:93); Hazel Green, Mariposa Co., *Jepson* 14,251; Huntington Lake, Fresno Co., *A. L. Grant* 1173; Cedar Creek, North Fork Kaweah River, *Jepson* 607; Bear Creek, North Fork Tule River, *T. Brandegee.* Tehachapi Mts.: Keene sta., *Hastings & Darland;* Bisses sta., *Dudley* 473; Ft. Tejon, *Davy* 2337. South Coast Ranges: Alum Rock, Mt. Hamilton Range, *Pendleton* 668; Big Sur, Santa Lucia Mts., *Davy* 7432; betw. King City and Jolon, *Eastwood;* upper Nacimiento River, *Jepson* 1693. S. Cal.: Santa Inez Mts., *Dunn;* Matilija Cañon, Ojai Valley, *Hubby* 17; Arroyo Seco, San Gabriel Mts., *Peirson* 451; Millards Cañon, San Gabriel Mts., *Peirson* 135; San Bernardino, *Parish;* Mill Creek Cañon, San Bernardino Mts., *Jepson* 5572; Palomar Mt., *Jepson* 1527; Witch Creek, San Diego Co., *Alderson* 432; Cuyamaca, *Abrams* 3838; Laguna Mts., San Diego Co., *T. Brandegee.*

Var. **fraterna** Jepson var. n. Leaves, especially beneath, hirsutulose, the stems and petioles similarly hirsutulose with short spreading hairs.—(Folia hirsutulosa, praecipue infra, caules petiolaque hirsutulosa similiter cum pilis patentis).—Arroyo Seco, San Gabriel Mts., 2000 feet, *Peirson* 451a (type).

Refs. — OSMORRHIZA BRACHYPODA Torr.; Dur. Jour. Acad. Phila. ser. 2, 3:89 (1855), type loc. Deer Creek near Nevada City, *Pratten;* Jepson, Fl. W. Mid. Cal. 347 (1901), ed. 2, 292 (1911), Man. 702 (1925). *Washingtonia brochypoda* Hel. Cat. N. Am. Pl. 5 (1898); C. & R. Contrib. U. S. Nat. Herb. 7:63, fig. 7 (1900). Var. FRATERNA Jepson.

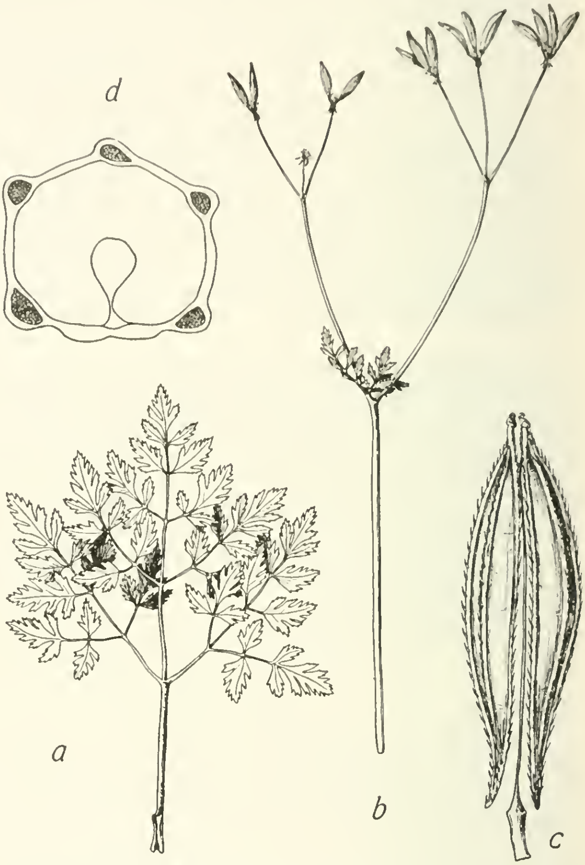


Fig. 276. OSMORRHIZA BRACHYPODA Torr. *a*, leaf × 1/6; *b*, umbel, × 1/3; *c*, fr., × 3; *d*, cross sect. of carpel, × 12.

2. **O. nuda** Torr. WOOD CICELY. Stem glabrous, 1½ to 2½ feet high; leaves 5 to 11 inches long, the cauline much reduced; stems and petioles with short stiff spreading hairs, the leaflets puberulent or hispidulous to glabrous or nearly so; leaflets ovate or elliptical, 3-lobed or -cleft and serrate, often narrowly or broadly cuneate at the entire base, ½ to 2½ inches long; rays 3 or 4 (to 6), 2 to 4 inches long; pedicels 3 to 11 lines long; involucels none; fruit 5 to 8 lines long, attenuate into a slender base ¼ to ½ as long as the body, and at apex more or less contracted into a beak ½ to 1 line long; attenuate base of fruit very bristly, the body upwardly bristly on the ribs; seed-face sulcate.

Montane woods: coastal Southern California, 5500 to 7000 feet; Coast Ranges, 50 to 2000 (or 4000) feet, from San Luis Obispo Co. to Siskiyou Co.; Sierra Nevada, 4000 to 7100 feet, from Tulare Co. to Modoc Co. Apr., fr. July-Aug.

Locs.—S. Cal.: Stonewall Mine, Cuyamaca Mts., *Parish* 4421; Saunders Mdw., San Jacinto Mts., *C. V. Meyer* 188; San Bernardino Mts. (Pl. World 20:247); San Antonio Mts. (Pl. World 22:111); Rock Creek, San Gabriel Mts., *Peirson* 491. Coast Ranges: Lopez Cañon, San Luis Obispo Co., *Unangst* 666; Big Creek, Santa Lucia Mts., *K. Brandegee;* Soquel Creek, Santa Cruz Mts., *Jepson* 14,255; Mt. Diablo, *Jepson* 14,254; Mt. Tamalpais, *Jepson* 14,257; St. Helena, *Jepson;* Comptche, Mendocino Co., *H. A. Walker* 369; Red Mountain Creek, nw. Mendocino Co., *Jepson* 9419; Bull Creek, Humboldt Co., *Jepson* 16,419; Eureka, *Tracy* 2464; Willow Creek, Trinity River, *Tracy* 3322; Quartz Valley, Siskiyou Co., *Butler* 1453. Sierra Nevada: Old Colony Mill, Tulare Co., *Jepson* 637; Huntington Lake, *Jepson* 13,074; Clover Mdw., Madera Co., *Kennedy;* Calaveras Big Trees, *A. L. Grant;* Eagle Mdws., South Fork Middle Stanislaus River, *A. L. Grant* 373; Silver Creek, Eldorado Co., *Kennedy* 56; Rich Pt., Middle Fork Feather River, *Jepson* 10,614; Pioneer sta., North Fork Yuba River, *Jepson* 16,824; Blue Lake, s. Warner Mts., *L. S. Smith* 1003; Medicine Lake, e. Siskiyou Co., *M. S. Baker* 505.

Note on variation.—The herbage as to pubescence or the lack of it shows a range from thinly hispidulose or pubescent to nearly glabrous. Individuals of undoubted Osmorrhiza nuda from Marin Co. are quite as glabrous as the form of northern California which has been called Washingtonia divaricata C. & R. The pedicels in Osmorrhiza nuda vary in length but since the long-pedicelled forms intergrade freely with the short-pedicelled form (Washingtonia brevipes C. & R.), the latter is not considered significant.

Refs.—OSMORRHIZA NUDA Torr. Pac. R. Rep. 4^5:93 (1857), type loc. Napa Valley, *Bigelow;* Jepson, Fl. W. Mid. Cal. 347 (1901), ed. 2, 292 (1911), Man. 702, fig. 682 (1925). *Washingtonia nuda* Hel. Cat. N. Am. Pl. 5 (1898). *Urospermum nudum* Ktze. Rev. Gen. Pl. 1:270 (1891). *Myrrhis nuda* Greene, Man. Reg. S. F. Bay 157 (1894). *Washingtonia brevipes* C. & R. Contrib. U. S. Nat. Herb. 7:66 (1900), type loc. Mt. Shasta and vicinity, *Palmer* 2481. *O. brevipes* Jepson, Madroño 1:119 (1923), as synonym. *O. nuda* var. *brevipes* Jepson l.c.; Man. 702 (1925); this form varies in pubescence as in the species; its pedicels are short (1½ to 3 lines) but they overlap the pedicel-length of the species. *Washingtonia divaricata* Britt.; Britt. & Brown, Ill. Fl. 2:531 (1897), type from Ore., *Nuttall. O. nuda* var. *divaricata* Jepson, Madroño 1:119 (1923), Man. 702 (1925); this is a nearly glabrous form but certain states of var. brevipes are also glabrous; as to the carpels they are no more beaked than in some specimens well representing the species.

3. **O. obtusa** Fer. SNUB CICELY. Resembles no. 2, but more slender, 1 to 1½ feet high; herbage almost glabrous; rays widely spreading or the lateral deflexed; fruiting pedicels 2 to 4, divaricate, 6 to 8 lines long; fruit 5 to 7½ lines long, obtuse or slightly pointed at the tip, less bristly.

Montane, 4000 to 5000 feet: Sierra Co. (Contrib. U. S. Nat. Herb. 7:65). East to the Rocky Mts., north to British Columbia.

Refs.—OSMORRHIZA OBTUSA Fer. Rhod. 4:154 (1902); Jepson, Man. 702 (1925). *Washingtonia obtusa* C. & R. Contrib. U. S. Nat. Herb. 7:64 (1900), type loc. Ishawood Creek, Wyo., *Rose* 476.

4. **O. occidentalis** Torr. BALD CICELY. Plants 2 to 3½ feet high; herbage minutely puberulent or nearly glabrous; leaflets oblong-lanceolate (or rarely ovate), serrate or sparingly incised, 1 to 1½ (or 2½) inches long, some of them obliquely lobed on one side by a deep incision toward the base; rays 5 to 12, in fruit erect (1 to 2¼ inches long) and forming a close or compact umbel; pedicels 1½ to 4 lines long; bracts 1 or 2 or none; stylopodium conical, about equaling the style; fruit 6 to 7 lines long, acutish at apex or obscurely short-beaked, with prominent acute not bristly ribs; seed-face very concave.

Wooded slopes, 3000 to 8500 feet: Coast Ranges from Mendocino Co. to Siskiyou Co.; Sierra Nevada from Madera Co. to Modoc Co. North to Alberta. June-Aug., fr. Aug.-Oct.

Locs.—Coast Ranges: Potter Valley, *Purpus;* Buck Mt., Humboldt Co., *Tracy* 4238; Shackelford Creek, w. Siskiyou Co., *Butler* 1668. Sierra Nevada: San Joaquin Pass, Madera Co., *Congdon;* Bloody Cañon, Mono Co., *Chesnut & Drew;* Rancheria Mt., Tuolumne Co., *Jepson* 4592; Kennedy Lake, Tuolumne Co., *A. L. Grant* 202; Fallen Leaf Lake, *Ottley* 1169; Silver Creek, Eldorado Co., *Kennedy* 72; Summit sta., Nevada Co., *Jepson* 14,258; Webber Lake, *S. B. Doten;* Morgan, Tehama Co., *Hall & Babcock* 4408a; Eagle Peak, Warner Mts., *Jepson* 7960.

Refs.—Osmorhiza occidentalis Torr. Bot. Mex. Bound. 71 (1859); Jepson, Fl. W. Mid. Cal. 347 (1901), ed. 2, 292 (1911), Man. 703 (1925). *Glycosma occidentalis* Nutt.; T. & G. Fl. 1:639 (1840), type loc. Blue Mts., Ore., *Nuttall*. *Myrrhis occidentalis* B. & H. Gen. Pl. 1:897 (1867). *Washingtonia occidentalis* C. & R. Contrib. U. S. Nat. Herb. 7:67 (1900).

5. **O. bolanderi** Jepson. Sheep Cicely. Stems stout, 3 feet high; herbage more or less puberulent, somewhat more pubescent at the nodes; leaflets broadly ovate, coarsely toothed, 1 to 2 inches long; fruiting rays spreading, 1½ to 3 inches long; fruit 8 to 9½ lines long, with a stout short beak; stylopodium flat, shorter than the style; seed-face deeply sulcate.

Woods, 1500 to 8000 feet: Mendocino Co. to Siskiyou Co.; Modoc Co. Apr., fr. July-Aug.

Locs.—Cahto (Contrib. U. S. Nat. Herb. 7:68); Long Gulch near Yreka, *Butler* 455; Lost Lake trail, Warner Mts., *L. S. Smith* 1019.

Refs.—Osmorrhiza bolanderi Jepson, Madroño 1:120 (1923), Man. 703 (1925). *Myrrhis bolanderi* Gray, Proc. Am. Acad. 7:346 (1868), type loc. Lambert Lake, Mendocino Co., *Bolander*. *Osmorrhiza occidentalis* var. *bolanderi* C. & R. Rev. N. A. Umbell. 119 (1888). *Washingtonia bolanderi* C. & R. Contrib. U. S. Nat. Herb. 7:68 (1900).

38. DAUCUS L.

Bristly or hispid annuals or biennials with dissected decompound leaves and white flowers. Umbels compound, concave, surrounded by cleft bracts and borne on long peduncles. Involucels of entire or toothed bractlets. Calyx-teeth obsolete. Fruit somewhat flattened dorsally. Primary ribs slender, bristly; secondary ribs with a single row of prominent barbed prickles. Oil-tubes as in Caucalis.—Species about 60, all continents. (Daukos, the ancient Greek name.)

Involucre divided into short linear or lanceolate segments; rays mostly 2 to 6 lines long................ 1. *D. pusillus.*
Involucre divided into elongated filiform or linear-lanceolate segments; rays 1 to 2¾ inches long.. 2. *D. carota.*

1. **D. pusillus** Michx. Rattlesnake Weed. Annual, 4 to 7 (or 22) inches high; stems and peduncles retrorsely hispid; leaves finely dissected into linear segments; rays mostly 2 to 6 lines long, sometimes as much as 1 or 1½ inches long, somewhat unequal; pedicels very unequal, commonly 1 or 2 lines long or almost wanting; fruit 1½ to 2 lines long.

Open grassy foothills, 100 to 4500 feet: throughout cismontane California. East to the Carolinas, north to British Columbia. Apr.

Field note.—The herbage is in rural repute as an antidote for the bite of the rattlesnake, whence Yerba de Vibora of the Spanish-Californians.

Locs.—S. Cal.: Santa Catalina Isl., *Blanche Trask;* San Bernardino, *Parish;* Cow Cañon divide, e. San Gabriel Mts., *Peirson* 500; North Pomona, *Braunton* 245; Ojai Valley, *Hubby;* Santa Cruz Isl., *Jepson* 12,088. Coast Ranges: Arroyo Grande, *Alice King;* Estrella plain, *Barber;* Lorenzo Creek, upper San Benito River, *Jepson* 12,240; San Francisco, *Greene;* Hopland, Mendocino Co., *Jepson* 9287; Willits, *Duran* 1439; Mail Ridge, s. Humboldt Co., *Jepson* 16,387; Little River (mouth), Humboldt Co., *Tracy* 2579; Redwood Creek, n. Humboldt Co., *Jepson* 1963; Martin ranch, South Fork Trinity River, *Jepson* 2021; Ely, sw. Tehama Co., *Jepson* 16,333. Sierra Nevada: Oriole Lake, Tulare Co., *W. Fry* 344; Mariposa Co. foothills (Zoe 3:29). Marysville Buttes: *Copeland* 3354.

Refs.—Daucus pusillus Michx. Fl. Bor. Am. 1:164 (1803), type from the Carolinas; C. & R. Contrib. U. S. Nat. Herb. 7:249, fig. 65 (1900); Jepson, Fl. W. Mid. Cal. 347 (1901), ed. 2, 293 (1911), Man. 703 (1925).

2. **D. carota** L. Carrot. Biennial; stems several, erect, branching, hispid, 2 to 3 feet high; root fleshy, conical; leaves several times dissected into linear or lanceolate segments; involucre divided into 3 or 5 filiform or narrowly linear-lanceolate segments; rays numerous, 1 to 2¾ inches long in fruit; umbels in fruit concave and like a bird's nest; fruit 2 lines long.

Valley lands or moist bottoms, 5 to 1500 feet, sparingly naturalized from Europe: occasional along the coast; more frequent in Southern California; rare in the Sierra Nevada foothills. July-Aug.

Locs.—Bodega, Sonoma Co., *Jepson* 15,936; Sonoma, *Jepson* 16,552; Alameda, *Jepson* 14,202; Alvarado, *Jepson* 14,203; Monterey, *Jepson;* Los Angeles (Erythea 1:59); Rivera, *Braunton* 284; Claremont, *Chandler;* San Bernardino (Zoe 2:27); near Smartsville, Yuba Co., *Jepson* 16,763.

Refs.—Daucus carota L. Sp. Pl. 242 (1753), type European; Jepson, Fl. W. Mid. Cal. 348 (1901), ed. 2, 293 (1911), Man. 703 (1925).

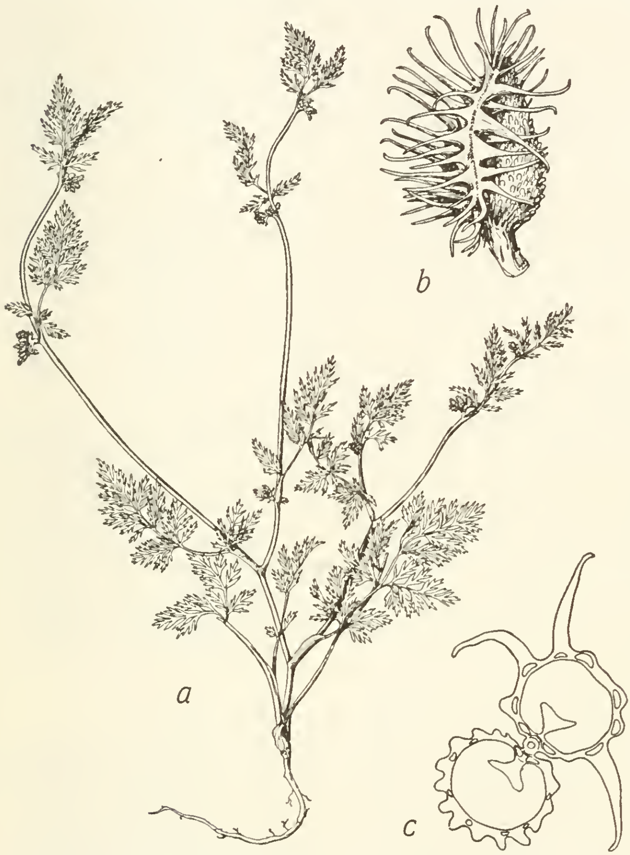


Fig. 277. Torilis nodosa Gaertn. *a*, habit, × ½; *b*, fr., × 6; *c*, cross sect. of fr., × 12.

39. **TORILIS** L.

Erect slender annuals with hispidulose herbage, bipinnate leaves and white flowers in subcapitate umbels. Involucre and involucels of linear bracts. Fruit with the secondary ribs more prominent than the primary and bearing a row of bristles or tubercles; bristles rough, hooked at tip. Oil-tubes solitary, 2 on the commissure.—Species 23, Europe, Asia and Africa. (Derivation unknown.)

1. **T. nodosa** Gaertn. Knotted Hedge Parsley. (Fig. 277.) Erect, 7 to 13 inches high, the stems with few branches, retrorsely scabrous; leaves pinnate (lower 3 to 5 inches long, the upper successively shorter); leaflets bipinnately dissected; umbels scattered along the stems opposite the leaves, on very short peduncles (1 or 2 lines long), simple or with a supplementary short proliferous umbel; fruits 1½ to 2 lines long, those on the outside of the umbel with the exterior carpel densely covered with hooked bristles, the inner carpels as well as the inner fruits warty and without prickles.

In shade on openly wooded hills, 5 to 2000 feet: naturalized from Europe, widely distributed in California. Apr.-May, fr. June.

Locs.—Oak Run, Shasta Co., *Baker & Nutting* in 1894; Paskenta, sw. Tehama Co., *Jepson* 16,315 in 1932; Little Chico Creek, *R. M. Austin* in 1883; College City, *Alice King* in 1905; Vacaville, *Jepson* 14,196 in 1891; French Camp, San Joaquin Co., *Sanford* in 1890–91; Auburn, *Shockley* in 1886; Ione, *Braunton* in 1904; Gwin Mine, Calaveras Co., *Jepson* 1817 in 1902; Burson, Calaveras Co., *Jepson* 9939 in 1923; Columbia, *Jepson* 6350 in 1915; Pine Log, Tuolumne Co., *A. L. Grant* 705 in 1916; Sausalito, *Bioletti* in 1891; Berkeley, *H. A. Walker* in 1907; Mt. Diablo, *Jepson* 9863 in 1923; Arroyo Grande, *Alice King* in 1895; Pt. Firmin near San Pedro, *A. Davidson* in 1914.

Refs.—Torilis nodosa Gaertn. Fruct. 1:82, t. 20, f. 6 (1788); Jepson, Man. 703 (1925). *Tordylium nodosum* L. Sp. Pl. 240 (1753), "France, Italy." *Caucalis nodosa* Huds. Fl. Angl. ed. 2, 114 (1778); Jepson, Fl. W. Mid. Cal. 348 (1901), ed. 2, 293 (1911).

40. CAUCALIS L.

Annuals with decompound leaves dissected into small segments. Flowers white. Umbels more or less irregularly compound. Involucre and involucels present. Calyx-teeth prominent. Fruit flattened laterally. Primary ribs 5, filiform, bristly; secondary ribs 4, prominent, winged, bearing barbed or hooked prickles. Oil-tubes solitary in the intervals, i. e., under the secondary ribs, 2 on the face.—Species 5, Europe, Asia and Africa. (Kaukalis, ancient Greek name for an umbelliferous plant.)

1. **C. microcarpa** H. & A. Erect, slender, 6 to 12 inches high; leaves 2 or 3 times ternate and much dissected, slightly hispid; umbels unequally 3 to 5-rayed; rays 1 to 3¾ inches long; pedicels ¼ to 6 lines long; involucre of foliaceous dissected bracts; involucels of entire or somewhat divided bractlets; fruit oblong, 2 lines long, armed with rows of hooked prickles.

Openly wooded hills, 100 to 3000 feet: coastal Southern California; Coast Ranges; Sierra Nevada foothills from Tulare Co. to Shasta Co. North to Washington, east to Arizona and south to Mexico. Apr

Locs.—S. Cal.: San Diego, *Dunn;* Fallbrook, *Abrams* 3318; Menifee, Riverside Co., *Alice King;* San Bernardino foothills, *Parish;* Eaton Cañon, San Gabriel Mts., *Peirson* 132; Ft. Tejon, *Davy* 2372. Coast Ranges: Arroyo Grande, *Alice King;* New Idria, *Brewer* 801; Los Gatos, *Heller* 7469; Vaca Mts., *Jepson* 14,200; Scotts Valley, Lake Co., *Tracy* 1705; Lodoga, w. Colusa Co., *Jepson* 16,275; Round Valley, Mendocino Co., *Bolander* 4699; Humboldt Bay, *Tracy* 2454; Hupa, *Chandler* 1315; Crane Creek, w. Tehama Co., *Jepson* 14,201. Sierra Nevada: Limekiln Creek, Tulare Co., *Jepson* 2801; Chowchilla School, Mariposa Co., *Jepson* 12,815a; Mokelumne Hill, Calaveras Co., *F. E. Blaisdell;* Little Chico Creek, *R. M. Austin;* Morleys sta., Shasta Co., *M. S. Baker.*

Refs.—Caucalis microcarpa H. & A. Bot. Beech. 348 (1840), type from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. 348 (1901), ed. 2, 293 (1911), Man. 704, fig. 683 (1925); C. & R. Contrib. U. S. Nat. Herb. 7:70, fig. 8 (1900).

GARRYACEAE. Silk Tassel Family

Shrubs or small trees with quadrangular branchlets. Leaves simple, opposite, evergreen, the short petioles basally and narrowly connate. Flowers dioecious, apetalous, borne along a pendulous catkin-like axis, 1 (in case of the pistillate) or a cyme of 3 (in case of the staminate) in the axil of each of the decussately connate bracts. Staminate flower:—calyx 4-parted into linear valvate sepals; stamens 4; filaments distinct. Pistillate flower:—calyx with a shortly 2-lobed or obsolete limb; ovary inferior, 1-celled, with 2 pendulous ovules; styles 2, stigmatic on the inner side, persistent. Fruit a berry; epicarp at maturity dry and brittle, free from the pulpy portion and dehiscing irregularly, or sometimes circumcissile. Seeds with thin testa and horny endosperm, the minute embryo at one end.—Genus 1. North America.

Bibliog.—Coulter, J. M., and Evans, W. H., [Revision of] Garrya (Bot. Gaz. 15:93–97,—1890). Eastwood, A., Notes on Garrya with description of new species and key (Bot. Gaz. 36: 456–463,—1903). Waugerin, W., Garryaceae in Engler, Pflzr. 4^{569}:1–18, figs. 1–5 (1910).

1. GARRYA Dougl.

The only genus.—Species 13. (Nicholas Garry, of the Hudson Bay Co., friend of David Douglas, the botanical explorer of Pacific North America, 1825–1832.)

Pubescence of tangled curly hairs forming a close felt on under surface of the leaves; leaves glabrous above.
  Leaves decidedly undulate-margined, more or less tomentose beneath; Coast Ranges................ 1. *G. elliptica.*
  Leaves plane, felty-tomentose beneath; S. Cal..2. *G. veatchii.*

Pubescence of straight silky hairs or almost glabrous; leaves plane.
  Leaves commonly yellowish (or bright green above), glabrous above and also below or nearly so; fruit glabrous, or seldom pubescent in maturity; n. Cal.....3. *G. fremontii.*
  Leaves not yellowish, white-silky beneath; fruit silky-pubescent.
    Leaves glaucous-gray above, 1½ to 3 inches long; mainly ranges bordering the deserts.... 4. *G. flavescens.*
    Leaves glossy dark-green above, ½ to 1⅛ inches long; North Coast Ranges........................ 5. *G. buxifolia.*

1. **G. elliptica** Dougl. SILK TASSEL BUSH. Commonly a shrub 5 to 8, or rarely a small tree up to 20 feet high; leaf-blades elliptical or narrower, the margin undulate and more or less revolute, glabrous above, tomentose beneath with short curly or wavy hairs, 1½ to 2½ inches long; catkins solitary or clustered, the staminate 4 to 7 inches long, with truncate or acute silky bracts and the calyx-segments cohering at tip, the pistillate shorter, 2 to 4 inches long, with acute or acuminate bracts; ovary sessile; fruit globose, 3 to 5 lines in diameter, densely white-tomentose, in extreme age glabrate; seed oval, 2 lines long.

Hill slopes and along winter water-courses, 20 to 1500 feet: Coast Ranges near the sea, from San Luis Obispo Co. to Del Norte Co. North along the Oregon coast. Jan.-Feb., fr. June-July.

Field note.—The foliage in general aspect is a little suggestive of that of Quercus agrifolia. The contrast between the dark green and often glossy upper side of the leaf and the white-tomentose lower side is usually marked. This species inhabits only the seaward Coast Range, save opposite the sea pass of the Golden Gate where it enters the Berkeley and Oakland Hills and opposite the Bodega fog gap where it occurs in the Hoods Peak range.

Locs.—Chorro Creek, San Luis Obispo Co., *Condit;* Pico Blanco, Monterey Co., *Davy* 7333; Carmel, *Patterson & Wiltz;* Corralitos, Santa Cruz Co., *Jepson* 14,153; Gold Gulch, Santa Cruz Co., *R. E. Burton;* Los Gatos, *Heller* 7220; Saratoga, *Jepson* 5635; Black Mt., Santa Clara Co., *Baker* 200; Lake Pilarcitos, San Mateo Co., *Davy;* Redwood Peak, Oakland Hills, *Jepson;* Lake Temescal, Berkeley Hills, *Bioletti;* Angel Isl., *McLean;* Mt. Tamalpais, *Jepson;* Bolinas ridge, Marin Co., *Jepson* 10,308; Inverness, *Jepson* 500a; Bodega, *Vina W. Krager;* Hoods Peak, Sonoma Co., *M. S. Baker* 1; Ft. Bragg, *W. C. Mathews;* Samoa, Humboldt Bay, *Tracy* 7231; Trinidad, n. Humboldt coast, *Geo. Parrish;* Smith River, Del Norte Co., *Goddard* 351.

Refs.—GARRYA ELLIPTICA Dougl.; Lindl. Bot. Reg. 1686 (1835), type from Cal., *Douglas;* Jepson, Fl. W. Mid. Cal. 362 (1901), ed. 2, 304 (1911), Man. 731, fig. 714 (1925).

2. **G. veatchii** Kell. CAÑON TASSEL BUSH. Shrub 6 to 8 feet high; leaf-blades oval, 1 to 2 inches long, slightly undulate, short-acuminate or almost aristate, short-petioled, smooth and shining above, densely tomentose below with short very fine closely curled hairs; fruit densely tomentose, 2½ to 4 lines in diameter.

Dry cañon and mountain sides, 150 to 7000 feet: cismontane Southern California from Santa Barbara Co. to San Diego Co.; perhaps also in Mariposa Co. South to Lower California. Jan.-May.

Locs.—Romero Cañon trail near Montecito, *A. L. Grant* 1671; Tuna Cañon, Verdugo Hills, Los Angeles, *MacFadden* 2940; Arroyo Seco near Los Angeles, *Braunton* 791; betw. Fish Creek and Monrovia Cañon, San Gabriel Mts., *Ottley* 626; San Antonio Cañon (n. of Claremont), *Peirson* 139; Cajon Pass, *Parish* 2844; Mt. San Jacinto, *B. D. Stark;* San Jacinto River cañon, *Parish* 11,697; Campo, San Diego Co., *Hall.*

Refs.—GARRYA VEATCHII Kell. Proc. Cal. Acad. 5:40 (1873), type loc. Cedros Isl., *Veatch;* Jepson, Man. 732 (1925). *G. veatchii* var. *palmeri* Eastw. Bot. Gaz. 36:458 (1903). *G. flavescens* var. *palmeri* Wats. Bot. Cal. 1:276 (1876), type loc. Milquatay, San Diego Co., *Palmer.* *G. veatchii* var. *undulata* Eastw. l.c. 36:458 (1903), type loc. Pasadena, *Allen.* *G. congdonii* Eastw. l.c. 36:459 (1903), type loc. Coulterville, Mariposa Co., *Congdon* (ex char.).

3. **G. fremontii** Torr. BEAR BRUSH. Shrubs 5 to 7 (or 10) feet high; leaf-blades elliptical, varying to oblong, tapering to each end, glabrous and shining above, gray-puberulent or white-tomentose beneath, in age often very glabrous and yellow, particularly on the under surface, not undulate, 1¼ to 2½ inches long, on petioles 6 lines long; catkins solitary or in clusters of 2 to 6, with acute somewhat silky bracts; staminate catkins 2 to 3 inches long; pistillate catkins about 1½ inches long, the ovary and young fruit very silky; fruiting catkins 1½ to 3½

inches long; mature fruit purple to black, glabrous, 3 lines long, short-pediceled; seeds subglobose or oval, 1½ lines long.

High chaparral ridges and slopes, (1000 or) 2000 to 7000 feet: Coast Ranges from Siskiyou Co. to Santa Clara Co.; Sierra Nevada from Butte Co. to Mariposa Co.; San Jacinto Mts. North to Washington. Feb.-Mar.

Locs.—North Coast Ranges: Yreka, *Butler* 1125; Marble Mt., w. Siskiyou Co., *Chandler* 1635; Shasta Sprs., *Jepson* 14,157; Deadwood divide, above French Gulch, sw. Shasta Co., *A. M. Alexander;* betw. Yocumville and Indian Bar, South Fork Salmon River, *Jepson* 2087; Don Juan Pt., Trinity River, Trinity Co., *Tracy* 7260; Bell Sprs., n. Mendocino Co., *Davy* 5346; Castle Peak, ne. Mendocino Co., *Jepson* 14,154; Mt. St. Helena, *Jepson* 14,159; Weldon Cañon, Vaca Mts., *Jepson* 14,156; Howell Mt., *Jepson* 5316; Hood's Peak, Sonoma Co., *M. S. Baker* 3; Mt. Tamalpais, *C. F. Baker* 3168; Mt. Hamilton, *Chandler* 6055; Loma Prieta, Santa Clara Co., *Davy* 509. Sierra Nevada: Buck Creek, Warner Mts., *L. S. Smith* 906; Jonesville, Butte Co., *Copeland* 667; Johnstown, Plumas Co., *L. S. Smith;* Deadman Creek, near Sonora Pass, *Jepson* 6554; Bald Mt., Tuolumne Co., *A. L. Grant* 668; Snow Creek, Yosemite, *Jepson* 10,492. S. Cal.: Tahquitz Valley, San Jacinto Mts., *Hall* 2452.

Refs.—GARRYA FREMONTII Torr. Pac. R. Rep. 4:136 (1856), type loc. upper Sacramento River, *Fremont;* Jepson, Fl. W. Mid. Cal. 363 (1901), ed. 2, 304 (1911), Man. 732 (1925). *G. rigida* Eastw. Bot. Gaz. 36:461 (1903), type loc. Mt. Tamalpais, *Eastwood. G. fremontii* var. *laxa* Eastw. Bot. Gaz. 36:462 (1903), type loc. Twin Lakes, Cañon Creek, n. Trinity Co., *Eastwood;* petioles 10 lines long; "peduncles" twice as long as the involucres (ex char.).

4. **G. flavescens** Wats. UTAH TASSEL BUSH. Large spreading shrub 6 to 12 feet high; herbage more or less pubescent with closely appressed straight silky hairs and with a glaucous gray color over entire plant; leaf-bades oval to elliptic, entire, acute at each end and recurved-mucronulate at apex, lower surface more or less densely pubescent, upper with scattered irregularly appressed hairs or glabrous, 1½ to 3 inches long; catkins solitary or clustered, the fertile short and thick; fruit globose, densely pubescent, almost sessile, 3 lines in diameter.

Arid montane slopes and ridges, 2000 to 6300 feet: Southern California mountains; north in the inner South Coast Range to San Benito Co. and in the Sierra Nevada to Fresno Co. East to Utah. Apr.

Tax. note.—Spms. from St. George, Utah, *Jones* 5005 (authentic material of Garrya flavescens), agree extremely well in leafage, pubescence and general aspect with spms. from the Charleston Mts., s. Nev. (*Purpus* 6091), and with the spms. cited below from the southern Sierra Nevada. The young leaves, green above and silky beneath, tend to become yellow in age and sometimes more or less glabrate.

Locs.—S. Cal.: Laguna Mts., e. San Diego Co., *Cleveland;* Julian, e. San Diego Co., *T. Brandegee;* Warner Pass, *Jepson* 8748; Santa Rosa Mts., *Clary* 1221; Cajon Pass, *Parish;* Rock Creek, n. side San Gabriel Mts., *Peirson* 138; Mt. Pinos, n. Ventura Co., *Hall* 6499; Providence Mts., *T. Brandegee.* Inner South Coast Range: San Emigdio Cañon, *Davy* 2126; San Benito Co., *Hall* 9940. Southern Sierra Nevada: Piute Peak, Kern Co., *Purpus* 5519; Little Kern Lake, Kern Cañon, *Jepson* 4922; Salt Creek, Tulare Co., *Eastwood;* Kings River Cañon, *Newlon* 233; Huntington Lake, *A. L. Grant* 1401.

Var. venosa Jepson. Leaves hairy-pubescent and dark green above, white beneath with a dense covering of long silky hairs, tipped with a cuspidate point ⅓ to 1 line long.—Yollo Bolly foothills, western Tehama Co.

Refs.—GARRYA FLAVESCENS Wats. Am. Nat. 7:301 (1873), based on material from "southern Nev. and Utah to Ariz. and N. Mex."; Jepson, Man. 732 (1925). *Garrya* ————? Wats. Bot. King 421 (1871). *G. veatchii* var. *flavescens* C. & E. Bot. Gaz. 15:96 (1890). *G. pallida* Eastw. Proc. Cal. Acad. Bot. ser. 3, 2:287 (1902), type loc. Kings River Cañon, *Eastwood.* Var. VENOSA Jepson, Man. 732 (1925), type loc. Greasewood Hills, w. Tehama Co., *Jepson* 178f.

5. **G. buxifolia** Gray. DWARF TASSEL BUSH. Low or depressed flat-topped bush 8 to 16 inches high and 3 to 4½ feet wide, or more erect and up to 10 feet high; leaf-blades elliptic to oval or broadly ovate, mostly obtuse but apiculate or mucronate, green and glossy above, densely white-silky beneath, ½ to 1⅛ (or 2) inches long; catkins slender, 1½ to 2½ inches long; capsule dark brown or purple, glabrous or nearly glabrous when mature.

Rocky summits, 4500 feet: northern Mendocino Co.; Siskiyou and Del Norte Cos. North to Josephine Co., Oregon. Mar.

Field note.—Garrya buxifolia occurs on the flattish summit of Red Mt., northern Mendocino Co., on the sides of broken-rock ledges. But one colony was noted in 1932, consisting of about two dozen plants (*Jepson* 16,544). In Del Norte Co. it is an important component of chaparral about Gasquet (*Tracy*). The following have somewhat larger leaves than the Red Mt. plants: Cold Spr., West Fork Woolly Creek, w. Siskiyou Co., *Butler* 40; Camp Six, Del Norte Co., *M. S. Baker* 304. Ore.: Waldo, *Howell*.

Refs.—GARRYA BUXIFOLIA Gray, Proc. Am. Acad. 7:349 (1867), type loc. Red Mt., n. Mendocino Co., *Bolander*. *G. flavescens* var. *buxifolia* Jepson, Man. 732 (1925).

CORNACEAE. Dogwood Family

Deciduous trees or shrubs, or some species low and merely suffrutescent. Leaves opposite, simple, entire. Flowers perfect, regular, in cymes or heads. Calyx-tube coherent with the ovary, its limb represented by 4 small teeth at the summit or none. Petals 4, epigynous, valvate in bud. Stamens 4, alternate with the petals. Ovary 2-celled with a single pendulous ovule in each cell; style filiform; stigma simple. Fruit a drupe, the stone 2-celled with 1 seed in each cell. Embryo minute.—Genera 10, species 100, all continents but mostly north temperate.

Bibliog.—Coulter, J. M., & Evans, W. H., Revision of N. Am. Cornaceae (Bot. Gaz. 15:30–38, 86–93,—1890). Wangerin, W., Cornaceae in Engler, Pflzr. 4^{229}:1–110, figs. 1–24,—1910.

1. CORNUS L. Cornel. Dogwood

Flowers greenish or white.—Species 47, North America, Europe and Asia, one species in East Africa. (Latin cornu, a horn, on account of the hardness of the wood.)

Flowers appearing after the leaves, borne in cymes, the cymes not involucrate.
  Leaves lighter color beneath, minutely puberulent; style glabrous; drupe commonly white.
    Leaves beneath with curly or spreading hairs; mostly low altitudes, throughout cismontane Cal..........1. *C. californica.*
    Leaves beneath with short straight hairs often attached by the middle; mostly high Sierra Nevada..........2. *C. stolonifera.*
  Leaves green, alike on both faces, nearly glabrous; style slightly pubescent; drupe bluish or pale..........3. *C. glabrata.*
Flowers appearing before or with the leaves, the inflorescence involucrate.
  Flowers yellowish, in sessile umbels with an involucre of 4 small caducous bracts; drupe black. 4. *C. sessilis.*
  Flowers greenish, in heads, with a conspicuous involucre of 4 to 6 white petal-like bracts; drupe red.
    Tree or shrub..........5. *C. nuttallii.*
    Herb-like with creeping rootstock..........6. *C. canadensis.*

1. **C. californica** C. A. Mey. Creek Dogwood. Shrub 5 to 15 feet high with purplish branches and branchlets; leaf-blades commonly ovate, varying to elliptical, acute, thinly puberulent, 2 to 4 inches long; cymes minutely and thinly puberulent, 1½ to 2 inches broad; petals oblong, acute, 2 lines long; styles glabrous; drupe white, subglobose, 3 lines in diameter; stone mostly oblique, somewhat flattened, with furrowed edges, each side with 4 less obvious or shallower channels.

Cañon stream banks and moist flats, and along rivers in the valleys, 5 to 2500 (or 6000) feet: Sierra Nevada from Shasta Co. to Tulare Co.; delta region of the Sacramento and San Joaquin rivers; Coast Ranges from Siskiyou Co. to San Luis Obispo Co.; coastal Southern California (rare). Apr.-Aug., fr. July-Nov.

Note on variation.—Cornus californica, with a wide horizontal and altitudinal range in California and with considerable diversity of habitat, is subject to much leaf variation, as to size and shape and in a minor degree as to presence or amount of pubescence. Pronounced variation may occur in a single locality. In the shade of Redwoods on upper San Leandro Creek, Oakland Hills, the leaves become thin, 4 to 6 inches long and 2½ to 3½ inches wide (*Jepson* 6212); a few yards away, under full insolation, shrubs bear thickish leaves mostly 1 to 2 inches long. In the woods of Pinus muricata at Inverness leaves become 7½ inches long and 5 inches wide (*Jepson* 1714). The shape of leaves on the sterile shoots and those of the flowering branches often differ markedly. The flowering period is extremely long, extending from April to August. The drupe is rarely blue (Rich Pt., Middle Fork Feather River, *Jepson* 10,629).

From the high Sierra Nevada species, Cornus stolonifera, Cornus californica is differentiated only by the character of the pubescence: the former has short straight appressed hairs on the leaves, the latter has longer curved or loosely spreading hairs. This difference, by reason of intergrade forms, is sometimes difficult to establish. The zonal distribution of Cornus stolonifera in California is Transition and Canadian, while that of Cornus californica is chiefly the lower margins of the Transition. This geographic difference is something, but, nevertheless, the specific concept of our various Cornus species were doubtless more consistent and better served if C. californica were subordinated to C. stolonifera as a variety.

Locs.—Sierra Nevada: Delta, Shasta Co., *Jepson* 6180; Pioneer sta., North Fork Yuba River, Sierra Co., *Jepson* 16,816; Bear Valley, Nevada Co., *Jepson* 14,144; Murphy, Calaveras Co., *Davy* 1540; Lake Eleanor, *A. L. Grant* 1243; Benson Lake, Tuolumne Co., *Jepson* 4516; Pine Ridge, Fresno Co., *Hall & Chandler* 77; Giant Forest, *K. Brandegee.* Delta region: Haas Slough, e. Solano Co., *Jepson* 14,145; Middle River, lower San Joaquin Co., *Jepson* 5695. Coast Ranges: Crescent City, *H. E. Parks;* Etna Creek, Siskiyou Co., *Butler* 86; North Fork Coffee Creek, Trinity Co., *Alexander & Kellogg* 215; Willow Creek, Trinity River Valley, *Tracy* 5949; Cahto, Mendocino Co., *Davy* 6623; Willits, *Jepson* 2492; Inverness, Marin Co., *Jepson* 1713; Berkeley, *Jepson* 8194; Oakland Hills, *Jepson* 6212; Saratoga, *Davy* 274; Fremont Peak, San Benito Co., *Elmer* 4905; Carmel River near Carmel, *Patterson & Wiltz;* Arroyo Grande, San Luis Obispo Co., *Brewer* 434. Southern California: Santa Maria, *Ida Blochman;* San Miguelito Creek, Lompoc, *Ewan* 7913; Cienega (Dav. & Mox. Fl. S. Cal. 267); Oak Knoll, Los Angeles, *Braunton* 652; Mescal Creek, n. side San Gabriel Mts., *Peirson* 3186; Deep Creek, San Bernardino Mts., *Hall* 1369; Strawberry Peak, San Bernardino Mts. (Bull. N. Y. Bot. Gard. 6:429); Mt. San Jacinto, *Hall* 2233; Palomar Mt., *Parish* 4465; Julian, San Diego Co., *T. Brandegee.*

Var. pubescens Mcbr. Cymes shaggy-pubescent.—Tulare Co. (Marble Fork Kaweah River, *Jepson* 660); Santa Cruz; Mendocino Co. North to Oregon.

Refs.—Cornus californica C. A. Mey. Bull. Phys.-Math. Acad. Petersb. 3:373 (1845), type from Cal.; Jepson, Man. 733, fig. 715 (1925). *Svida californica* Abrams, Bull. N. Y. Bot. Gard. 6:429 (1910). *C. pubescens* var. *californica* C. & E. Bot. Gaz. 15:37 (1890); Jepson, Fl. W. Mid. Cal. 361 (1901), ed. 2, 305 (1911). Var. pubescens Mcbr. Contrib. Gray Herb. 56:54 (1918); Jepson, Man. 733 (1925). *C. pubescens* Nutt. Sylva 3:54 (1849), type loc. "borders of the Oregon and Wahlamet", that is, Columbia and Willamette rivers, *Nuttall. C. sericea* var. *occidentalis* T. & G. Fl. 1:652 (1840), "Northwest Coast", *Douglas, Tolmie, Scouler,* and San Francisco, *Chamisso. C. occidentalis* Cov. Contrib. U. S. Nat. Herb. 4:117 (1893). *C. torreyi* Wats. Proc. Am. Acad. 11:145 (1876), "central Cal.", *Torrey. C. greenei* C. & E. Bot. Gaz. 15:36 (1890), the locality unknown.

2. **C. stolonifera** Michx. American Dog-berry. Shrub 2 to 10 feet high, usually stoloniferous; herbage, especially the under side of the leaves, appressed-hirsutulose; leaf-blades ovate or ovate-lanceolate, shortly acute, entire, 1 to 5 inches long; cymes 1 to 2 inches wide; petals dull white, linear, 2 lines long; drupe subglobose, white to bluish, 2 to 3 lines long.

Montane slopes and cañons, mostly (3000 or) 6000 to 7200 feet: Sierra Nevada, mainly east side or easterly valleys, from Tulare Co. to Modoc Co. North to Canada, east to Arizona and Virginia. July.

Locs.—Lewis Camp, Kern River Cañon, *Jepson* 975; Sequoia Creek, Tulare Co., *W. Fry* 5; Tamarack Creek, Fresno Co., *Wieslander;* Lake Merced, Merced River, *Jepson* 3204; Convict Creek, Mono Co., *Almeda Nordyke;* Deadman Creek, Middle Fork Stanislaus River, *Jepson* 6562; Glen Alpine Cañon, Eldorado Co., *Abrams* 12,707; Donner Pass, *Heller* 7045; Stirling, Butte Co., *Heller* 10,817; Mt. Bidwell, ne. Modoc Co., *Jepson* 7906.

Refs.—Cornus stolonifera Michx. Fl. 1:92 (1803), "along rivers and brooks, Canada and New England"; Smiley, Univ. Cal. Publ. Bot. 9:274 (1921).

3. **C. glabrata** Benth. Brown Dogwood. Shrub 5 to 12 (or 22) feet high, with nearly or quite glabrous twigs; leaf-blades ovate or oblong, acute at each end or shortly pointed at apex, 1¼ to 2 inches long, green on both faces, often reddish-brown in age, obscurely pubescent with short scattered appressed hairs; petioles 1 to 3 lines long; flowers many in small cymes; petals clear white; style slightly pubescent; drupe globose, the flesh whitish or bluish; stone little compressed and not at all or obscurely furrowed.

Stream bottoms, borders of swamps and bases of low hills, often forming thickets, 5 to 4400 feet: Sierra Nevada foothills from Shasta Co. to Tulare Co.;

delta region of the Great Valley; Coast Ranges from Siskiyou Co. to San Luis Obispo Co.; coastal Southern California. May-June.

Biol. note.—Along the cañon bottom of Saratoga Creek in Santa Clara Co. (where observed in August, 1912), Cornus glabrata grows in abundance, forming considerable thickets of a sort typical of this species. The larger individuals become 15 to 22 feet high; the unbranched trunks are slender and 8 to 12 feet high; the diameter up and down the trunk is about the same throughout and averages 2½ inches. Such tall stems bear rather narrow crowns whose branchlets usually have a tendency to droop. Sometimes the drooping branchlets become very long and cord-like and occasionally reach the ground and take root. Those which are properly spoken of as pendulous have very few and very short branchlets. One pendulous cord measures 16 feet 7 inches in length, about 3 or 4 feet of it trailing on the ground. Similar observations have been made in the Sierra Nevada: in the foothills near Dunlap, Ralph Hopping reports Cornus glabrata shrubs as developing cord-like branchlets which root where they strike the soil.

The ordinary foliage leaves of the flowering branches are on the whole fairly uniform in size and shape. From these the leaves of typical sterile shoots differ somewhat markedly; their blades are usually elliptic (and abruptly acute), sometimes suborbicular. The axillary winter buds of sterile shoots, formed from August to October, are slender and about 1½ to 2 lines long. Such elongated buds do not usually appear in the leaf axils of the flowering branchlets. In the Los Buellis Hills near Milpitas, R. J. Smith notes that the green stage of the drupe is succeeded by a white or milk-color stage; this color becomes tinged with blue, or later becomes fully light blue, then fades to white again where there is full insolation.

Locs.—Sierra Nevada: Delta, Shasta Co., *Jepson* 6181; Cool, Placer Co., *A. R. Valentien;* Sweetwater Creek, Eldorado Co., *K. Brandegee;* Columbia, Tuolumne Co., *Jepson* 6343; Dorst Creek, Tulare Co., *W. Fry.* Delta region of the Great Valley: Walnut Grove, Grand Isl., *Jepson* 14,382. Coast Ranges: Yreka Creek, *Butler* 89; Cecilville, South Fork Salmon River, *Jepson;* Rattlesnake Creek, Trinity Co., *Tracy* 6488; Hay Fork Valley, Trinity Co., *Tracy* 6476; Round Valley, ne. Mendocino Co., *Goddard* 615; Long Valley, Mendocino Co., *Jepson* 1869a; Sherwood Valley, Mendocino Co., *Jepson* 2194; betw. Potter Valley and Mt. Sanhedrin, *Jepson* 14,152; Middle Creek, foot of Elk Mt., n. Lake Co., *Jepson* 14,322; Scott Valley, Lake Co., *Jepson;* Alexander Valley, Sonoma Co., *Jepson* 9488; Pope Creek, Napa Co., *Jepson* 14,151; Wooden Valley, e. Napa Co., *Jepson* 14,149; Wild Horse Cañon, nw. Solano Co., *Jepson* 2451b; Green Valley, w. Solano Co., *Jepson* 1740; Pine Cañon, Mt. Diablo, *Jepson* 14,150; Los Buellis Hills, Santa Clara Co., *R. J. Smith;* upper Nacimiento River, Monterey Co., *Jepson* 1694; Stone Cañon, se. Monterey Co., *Condit;* Estrella, San Luis Obispo Co., *Jared;* Pozo, se. San Luis Obispo Co., *Eastwood.* Coastal S. Cal.: Alamo Peak, Ventura Co., *Dudley & Lamb* 4652; Banning Cañon, Santa Catalina Isl., *Jepson* 3046; Hemet Valley, San Jacinto Mts., *Munz* 5086.

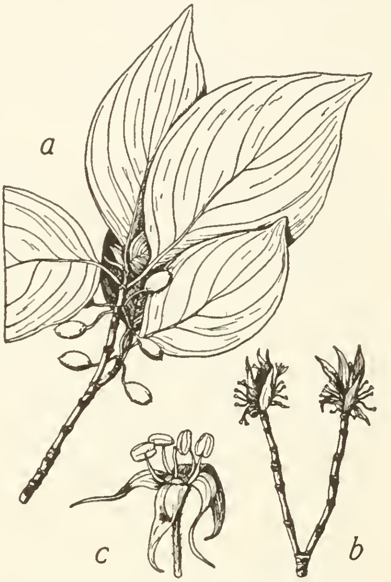


Fig. 278. Cornus sessilis Torr. *a*, fr. branch, × ½; *b*, fl. branch, × ½; *c*, fl., × 4.

Refs.—Cornus glabrata Benth. Bot. Sulph. 18 (1844), type loc. "San Francisco", *Hinds;* Jepson, Fl. W. Mid. Cal. 361 (1901), ed. 2, 305 (1911), Man. 733, fig. 716 (1925). *Svida catalinensis* Millsp. Field Mus. Publ. Bot. 5:189 (1923), type loc. Santa Catalina Isl., *Polley.*

Cornus costulata Jepson, Fl. W. Mid. Cal. ed. 2, 306 (1911), type loc. Round Valley, ne. Mendocino Co., *Goddard;* stone with 8 filiform longitudinal ridges.

4. **C. sessilis** Torr. Miners Dogwood. (Fig. 278.) Clumpy shrubs or small trees, 5 to 9 (or 13) feet high; leaf-blades obovatish, acute, 2 to 3½ inches long, shortly petioled; flowers yellowish, in small sessile umbellate clusters subtended by 4 small caducous bracts; pedicels 2 to 3 lines long; drupe oblong, at first greenish-white, then yellow, then red, maturing purple-black, shining, 5 to 6 lines long, on a pedicel as long.

Stream banks in the hills, commonly forming thickets, 1800 to 3600 feet: Sierra Nevada foothills from Amador Co. to Siskiyou Co.; Trinity and Humboldt Cos. Apr.

Note on the fruit.—"The drupe is purple-black when ripe, like a black tartarian cherry, and quite as juicy, shining and smooth. The pulp gives a strong purple stain. The sweetish taste would be pleasant but for an intense bitter accompanying it. It ripens in the middle of August" (J. P. Tracy, Three Creeks, n. Humboldt Co., 1921, in Jepson Corr. 15:312. ms.).

Locs.—Sierra Nevada: Carpenters Gulch, Amador Co., *Hansen* 1506; Pacific House, Eldorado Co., *K. Brandegee;* Alta, Placer Co., *Louise Delius;* Rich Pt., Middle Fork Feather River, *Jepson* 10,608; West Branch, Butte Co., *Heller* 11,514; Wilson Cove, Deer Creek, Tehama Co., *C. M. Wilder;* Winthrop, Shasta Co., *Jones & Alexander;* McCloud River, *W. E. Ritter.* North Coast Ranges: Martin ranch, South Fork Trinity River, *Jepson* 2014; Three Creeks, *Tracy* 6040; Hupa Mt., *Davy* 5634; Rush Creek, Trinity Co., *H. S. Yates* 378.

Refs.—Cornus sessilis Torr.; Dur. Jour. Acad. Phila. ser. 2, 3:89 (1855), type loc. Deer Creek, near Nevada City, *Pratten;* Torr. Pac. R. Rep. 4:94, pl. 8 (1857); Jepson, Man. 734 (1925).

5. **C. nuttallii** Aud. Mountain Dogwood. Tree 10 to 30 (or 45) feet high; leaf-blades narrow- or elliptic-obovate or even orbicular, with rounded or shortly acute apex 3 to 5 inches long, on petioles 2 to 3 lines long; flowers crowded in a head on a thick convex receptacle and surrounded by a conspicuous petal-like involucre; bracts of the involucre 4 to 6, white, sometimes tinged with red, obovate to oblong, 1½ to 3 inches long; heads ½ to 1 inch broad, very dense, borne on peduncles 1 to 1¼ inches long; drupe 5 to 6 lines long, scarlet.

Mountain woods, 1500 to 5100 feet: Cuyamaca Mts. to the San Gabriel Mts.; Santa Lucia Mts.; Santa Cruz Mts.; North Coast Ranges from Marin Co. to Siskiyou Co.; Sierra Nevada from Tulare Co. to Shasta Co. North to British Columbia. Apr.-May.

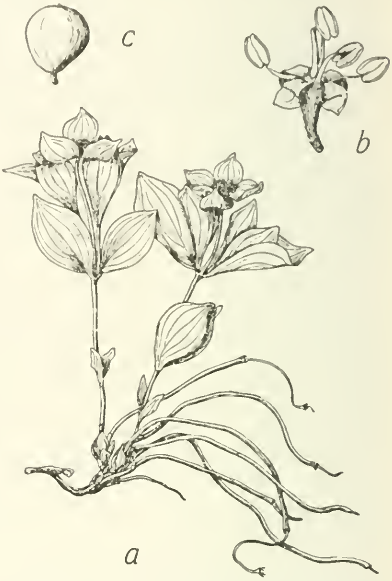


Fig. 279. Cornus canadensis L. *a*, habit, × ½; *b*, fl., × 5; *c*, fr., × 1.

Locs.—Coastal S. Cal.: Cuyamaca Peak, *Munz & Harwood* 7257; Palomar Mt., *McClatchie;* Dark Cañon, Mt. San Jacinto, *Hall* 2245; San Bernardino Mts. (Pl. World 20:247); Cascade Cañon, San Gabriel Mts. (Bull. S. Cal. Acad. 23:129). South Coast Ranges: Monterey (Bot. Mex. Boundary 71); Santa Cruz Mts. (Anderson, Nat. Hist. Santa Cruz Co. 38). North Coast Ranges: Mt. Tamalpais, *Newlon* 89; Howell Mt., *Jepson* 14,142; Calistoga (sw. of), *Jepson* 14,141; Mt. St. Helena, *Jepson* 10,385a; South Mill Creek, Ukiah, *Jepson;* Hawley School, Willits, *Jepson* 2411; Cahto, Mendocino Co., *Jepson;* Briceland, *Jepson;* Camp Grant, Humboldt Co., *Jepson;* Bull Creek, South Fork Eel River, *Jepson;* Martin ranch, South Fork Trinity River, *Jepson;* Salmon Summit, *Jepson;* betw. Cuddihy and Dutch Henry's, w. Siskiyou Co., *Jepson;* Clear Creek, w. Shasta Co., *Blankinship;* Shasta Sprs., *Jepson* 14,143; Sisson, *Jepson* 14,140; Humbug, Siskiyou Co., *Butler* 766. Sierra Nevada: Garfield Forest, Tulare Co., *Jepson;* Colony Mill, Marble Fork Kaweah River, *Jepson;* Sequoia Lake, Fresno Co., *H. P. Kelley;* Kinsley, Mariposa Co., *C. M. Hoak;* Yosemite Valley, *Patchett & Wright;* Hetch-Hetchy Valley; Yankee Hill, Tuolumne Co., *A. L. Grant* 670; Calaveras Big Trees, *Jepson;* Rich Pt., Middle Fork Feather River, *Jepson;* Berry Creek, Butte Co., *Jepson;* Meadow Valley, Plumas Co., *Fritz & Harris;* Viola, Tehama Co., *J. Grinnell;* Hatchet Creek mts., Shasta Co., *Baker & Nutting;* Bowens Sprs., Modoc Co., *M. S. Baker* 515.

Geog. note.—In Southern California and in the South Coast Ranges the known localities for Cornus nuttallii are few, scattered and restricted in area. One station is dubious: After more than eighty years there has been no validation of the record "Monterey" in the Botany of the Mexican Boundary. In the North Coast Ranges, on the contrary, the Mountain Dogwood is often a marked constituent of the forest in the Mendocino and Humboldt woods. It is also frequent in portions of the Sierra Nevada.

Refs.—Cornus nuttallii Aud. Birds of Am. t. 467 (1837), Ornith. Biog. 4:482 (1838); T. & G. Fl. 1:652 (1840); Nutt. Sylva, ed. 2, 2:117, t. 97 (1865), type loc. Fort Vancouver, Columbia River, *Nuttall;* Jepson, Fl. W. Mid. Cal. 361 (1901), ed. 2, 305 (1911), Trees of Cal. 206 (1909), Silva of Cal. 270 (1910), Man. 734, fig. 717 (1925).

6. **C. canadensis** L. Bunch-berry. (Fig. 279.) Herb-like; stems 3 to 9 inches high with a whorl of 4 to 6 leaves at summit, a pair of leaves about the middle, and scales below; blades of leaves of summit whorl obovate, acute, 1 to 1¾ inches long; involucre white, petal-like, its bracts broadly ovate, 5 to 8 lines long; drupe globose, red, turning black, about 3 lines broad.

Swamps or moist woods, 20 to 3500 feet: Mendocino and Humboldt Cos. Oregon to Alaska and New England. June.

Locs.—Mendocino City, *Bolander* 4776; Noyo River, Mendocino Co., *Davy* 6558; Bald Mt., Humboldt Co., *Tracy* 6356.

Refs.—Cornus canadensis L. Sp. Pl. 118 (1753), type from Canada; Jepson, Man. 734 (1925).

ERRATA

Page 158, no. 23. **Ribes marshallii** Greene, Under "Locs." delete "Buck Mt., Humboldt Co., *Tracy* 4189".

Page 172, no. 5. Delete "Rubus pedatus Sm." and insert **Rubus lasiococcus** Gray, Proc. Am. Acad. 17:201 (1882), type loc. Mt. Hood, Ore., *Hall* 140. This new determination of the Humboldt County material is made by J. P. Tracy (cf. Jepson Corr. vol. 37. 1936. ms.). As implied on page 172 ante, we have seen no California specimens.

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